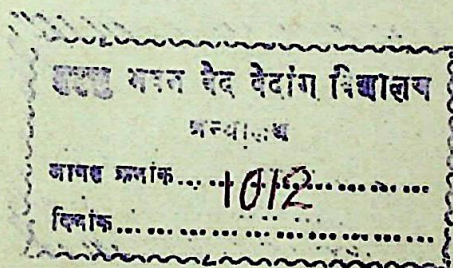


**A
TEXT BOOK
OF
WORLD RESOURCES
AND
TRADE**



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OF
WORLD RESOURCES
AND TRADE**

By

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PREFACE

Delhi University (Department of Commerce) need to be congratulated on reorienting the Syllabus of B.Com. (Hons.) course in general and that of Economic and Commercial Geography in particular. The syllabus of *World Resources and Trade* is, in fact, a study of World resources on the one hand and International trade on the other. To consider it as merely a readjustment of the topics of Economic and Commercial Geography would, therefore, be a fallacy. It is, as a matter of fact, a composite study of two very important aspects of the world economy—resources and trade, which are of immense value to any student.

But the pity is that students find it impossible to get in any single book all that they require to meet the demands of the subject. In order to get an idea of the different aspects of world resources and trade, they are called upon and often have to consult the pages of several different books, reports and treatises. That in itself, is a stupendous task. It is time consuming, and is also not able to give to the student a comprehensive integrated view of the whole subject.

A Text Book of World Resources and Trade aims at fulfilling this imperative need. The subject matter has been treated most lucidly and analytically with the help of examples, maps, diagrams and tables. The division of the matter into 24 chapters and of each chapter into a number of sections and sub-sections with suggestive sub-headings makes the reading extremely simple and cogent. The statistical information has been brought in at the relevant points in order to strengthen the argument or clarify the trends and features. The figures and tables have invariably been drawn from U. N. Publications and Government Reports and are therefore the most authentic.

About 50 maps and charts and about 150 model questions drawn from University Examination papers, arranged in accordance with the content of chapters, should not only help to bring

home to the reader the purport of the subject matter but also make him see the text in the proper perspective, so very essential for real knowledge of the subject through an understanding of the contents of the course prescribed.

The Lecturewise synopsis of the different topics that comprise the prescribed course has been given with the same end in view, so that the reader is able to make the best use of this *Text Book* in his preparation both for the class-room and the examination.

While any suggestions for the improvement of the book will be most welcome, it is hoped that the readers will find the book useful and entertaining.

15th August 1970.

K. P. M. Sundharam.
A. N. Kapoor

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- II ROLE OF MAN, NATURE AND CULTURE IN THE RESOURCE CREATION** (1 Lecture)
- III MEANING AND TYPES OF ENVIRONMENT** (1 Lecture)
- IV EFFECTS OF ENVIRONMENT ON ECONOMIC ACTIVITIES** (3 Lectures)
- V THE REGIONS OF HIGH AND LOW DENSITIES OF POPULATION IN THE WORLD** (2 Lectures)
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Total Number of Lectures=80

CHAPTER I

Man's Economic Activities And Environment

1. NATURAL RESOURCES : MEANING AND NATURE

The natural resources of a country consist of fertile land, animals, forests, fisheries. On this depends the economic development of a country. Of these natural resources, the presence of industrial minerals like coal and iron is the most important. This is an age of minerals and no country can modernize itself unless it possesses a sufficient supply of coal and iron. The variety of the richness of natural resources in a country determines the patterns of occupation of the people. If there are more kinds of natural resources, there would be more varied human occupations. Different occupations lead to different states of economic development and accordingly the economic state of a country is revealed. The mineral resources of a country exert such an important influence on human life that by exploiting them, the people of a region can develop their industries. South Africa is a very clear example. The gold find in South Africa led to the establishment of other industries. Similarly in Australia, with the discovery of gold mines at Calgoordie and Coolgardie, a new chapter was opened in the colonization and development of Western Australia. Forest resources are no less important. The vast forest wealth of Norway and Sweden is the basis of several industries in those countries. Ship-building, paper, match, furniture, etc. get their raw material from forests. In Japan, the forests are a very important source of industrial raw materials. The animals found in the forest are also very important economic resources and they are useful in making human activity take a new turn. The fertile soil, is however, the most important of all the resources. On it depends the occupation, of agriculture and from its occupation, man gets not only the articles of food but also raw materials for the industry. Soils are of several types and according to the presence of plant-food and their structure they are useful for one type of crop or the other. Water resources of a country come last but do not occupy less importance in any way. The rivers, lakes and seas of a country exercise a very great influence on the life, industry and commerce of the people. The development of fisheries depend on water resources. Great Britain, Norway, New Zealand, Japan and the coasts of Canada have developed fishing to a very great extent. Fishing gives the people a training in navigation and thus the people become seafaring, intelligent, adventure loving, courageous and active. That is how these countries of the world have become the leaders of shipbuilding industry. The water resources of a

country are also useful from the point of view of irrigation, navigation and development of industrial power.

2. ROLE OF MAN, NATURE AND CULTURE

The two factors that contribute most vitally to the economic progress of a country are the quality of its people and diversity and richness of its resources. Of these two basic elements of economic progress the human factor is far more important than the physical factor. There are countries in the world which have achieved very high level of cultural and economic progress in spite of the lack of natural resources. Switzerland and Japan are two very great examples. On the other hand, there are examples of countries where the native people made no economic progress even though there were large natural resources. U.S.A. is a classical example of the second type. Before the coming of the Europeans into the country, the Red Indians led a life of nomads and did not make any progress.

Stage of Civilization and Economic Well-being—It is not enough for nature to provide a country with valuable resources. Man must know how to take them out and how to use these resources to his benefit. Suppose nature has provided a country with good storage of coal. But the country may remain backward and no manufacturing industry may flourish there. Much depends on man's ability to exploit the resources of his environment and man's ability depends on the stage of civilization in which his countrymen are living.

All the world's people are not in the same stage of civilization, but they are in the stages, right from the primitive stage to the most highly cultured stage. In Australia, islands of the Pacific and interiors of Africa, there are some tribes who are in the same condition as their ancestors lived thousands of years ago. These savages live by gathering and hunting.

There are others who are only beginning to lose their savage habits and are slowly becoming civilized. These little civilized people also do not make full use of their resources. Nature has given them richest soils but they have only primitive tools of agriculture. Their hoes or digging sticks just scratch the soil and they sow the seed by broadcast method. The result was that those people produce food they need and live on subsistence basis. In Assam and Madhya Pradesh there are some tribes who engage themselves in primitive agriculture.

Some countries were long civilized. They learnt arts and sciences thousands of years ago. But their main occupation has been agriculture, and they are still agriculturist countries. India and China are the examples of such countries. In China there are probably the richest stores of coal and iron in the world. But they make comparatively little use of their coal and iron. Now-a-

days the Chinese have made a tremendous efforts to utilize their coal and iron and they are on the road of becoming a great manufacturing country. In India, too, millions of our people are farmers but we began to use our coal and iron much earlier than China. Our five-year plans are sincere efforts on our part to make India a great manufacturing country. In Europe and N. America people are the most highly cultured people in the world. They have done much to change geography. In the drier parts of U.S.A. they made reservoirs and changed the deserts into fertile lands. In swampy areas they drained the surplus water and filled in the marshes and swamps. In mountainous countries they dug tunnels and made roads and railways. They flattened the hill sides to grow crops. In difficult jungles they cut the trees and carved out fields. They cut water-ways through the neck of the land area. They made ports where it was not possible to make one. Thus, they changed the face of the earth for their advantage.

Quality of People and Population—The resources of environment can only be exploited if the people are present in sufficient number and have the ability to exploit the resources. People and population of a country are of prime importance for the cultural and economic progress. The quality of people and the density of population in a country determine the level of civilization, the pattern of occupations, extent of internal market, capital formation, standard of technology, extent and composition of foreign trade, per capita income and the standards of living of the people. Man's knowledge, intelligence and culture as also the social structure of the country he lives in, are of very great importance. As a matter of fact, the quality of the people of a country depends upon three factors—intelligence of the people, their cultural heritage and their physical environment.

Race and Intelligence—High intelligence is independent of race. People of different races are found in different parts of the world and modern researches have shown that they are the descendants of the following seven races only :—

1. Negrito, 2. Negro, 3. Australoid, 4. Mediterranean,
5. Nordic, 6. Alpine and 7. Mongolic.

There has often been a mixture of these races and people found in the various parts of the world are the examples of interbreeding that has gone on for countless ages amongst these racial groups. As a matter of fact intelligence is the result of hereditary traits of a human society. Intelligence of a man is brought out through selective processes. These selective processes may be natural, social or sexual. Natural selection results from the residents of a human society having lived for long time in a new environment after immigration. By means of struggle with nature and by the operation of the rule of the 'survival of the fittest' less active and less intelligent elements of the society are eliminated in every generation. By means of group migration of

the people another type of natural selection takes place. In the course of facing the obstacles, dangers, privations, only the better type increases and weaker types get eliminated. Social selection takes place when the intelligent people of a country migrate to another country leaving the dead weight of population behind. Normally, it is seen that those who have got the capacity of going abroad, are the most intelligent, and the most enterprising part of the population of a country. The examples of Japan and the U.S.A illustrate this point. The cream of the population of Europe moved to the U.S.A. while the cream of the population of China went to settle in Japan and that is why we find that these two countries of the world have gone so much ahead in economic development.

Cultural Heritage and Intelligence—Cultural Heritage of people is the historical experience which leads them to develop new technology and social character. People of the present generation derive their knowledge and experience from their ancestors. The better the cultural heritage the greater is the economic progress which such people are likely to make. If backward people go to inhabit an environment, they will not be able to make much headway but if the colonists are scientifically advanced, they shall play an important part in the progress of the new place where they have settled.

Physical Environment and Man's Intelligence—Climate, areal space and the richness of the natural resources affect the intelligence of the people. (a) As has been pointed out earlier, ideal climatic conditions for man's development are found where there is a seasonal change of temperature and the average temperature ranges from 40°F. to 60°F. Although no country in the world possesses an ideal climate, but the countries round the North Sea and the northern part of the U.S.A. and Newzealand are the nearest to the ideal. (b) The natural resources offer varieties of occupations for the exercise and improvement of human intelligence. Hunting, gathering and fishing industries which are most primitive in their nature offer the least scope for the exercise of the intellect. Agriculture is somewhat better but the best opportunity is afforded by the modern system of manufacture, mechanised agriculture, modern means of transport and communication and international trade. Political administration is also a good training ground for people's intellect. (c) The extent of the areal space of a country also affects its progress, economic strength and general advancement. Man-land ratio is of great significance to the progress of a country. If a large number of people are crowded together in a small area, their per capita resources will be meagre and the struggle for existence will be keen. Such people are found to be greedy, self-centred and even anti-social. Such people with small minds can hardly make a big nation. They only develop subsistence economy which has a restrictive effect on the trade and commerce of a country. On the

other hand, a country of a large size inhabited by the proper number of people in prosperous condition possesses immense economic strength and capacity to progress ahead.

Density of Population—The density of population is directly related to the advancement of economic life of a country. If the people in a country are more than the optimum, they are as much a problem for that country, as less than the optimum is in the country where for want of proper numbers, the natural resources cannot be properly exploited. If India and China are suffering from the bane of over-population, Canada and Australia have got the problem of insufficient number of people. Relationship between the density of population and economic development will be clear from the following table :—

Density per sq. mile	Sequence of Occupance.
1 to 8	Hunting and fishing.
8 to 26	Animal husbandry and carpentry.
26 to 64	Primitive or Extensive agriculture.
64 to 192	Advanced or Intensive agriculture.
192 to 256	Trade, commerce and industry.
256 to 381	Mixed economy with highly developed agriculture industry.
Over 381	Peak of industrialization.

This is the ideal condition and a study of the economic adjustment made by the people in different parts of the world shows that a progressive society has generally passed through the successful stages of hunting, pastoralism, primitive agriculture or advanced or intensive agriculture, manufacturing and commerce in accordance with the size of their population.

Social Structure of a Country—Finally man is a social animal and, therefore, he wants to live in society. From the point of view of a country's economic and cultural progress, the social structure of a country must be well-integrated. If there is conflict and disharmony between different communities or if the people are conservative in their outlook and ill-fitted to utilize their resources, the structure is said to be dis-integrated. By the elimination of friction and conflict from among the various sections of population by guaranteeing them equal opportunities for progress, if a feeling of fraternity, patriotism and solidarity is fostered, the country's social structure is said to be integrated. The strength of the U.S.A. and the U.S.S.R. lies in the unity of their people. A country with an integrated society, cannot be beaten in the race for economic leadership.

Thus, resource creation depends upon nature, quality of people and their number and the culture or type of society they live in.

3. MEANING AND TYPES OF ENVIRONMENT

There is a very close relationship between man and his

surroundings and the influence of the surroundings on the habits, customs and character of man is very great. The factors which constitute the surroundings or environment of man provide an occasion to man to develop himself in the economic field. How man is able to utilize the resources given in his surroundings depends upon his hard work, intelligence, knowledge and capital. In the United States of America, the surroundings and resources of the environment remained completely undeveloped because the early people who were living there, the Red Indians, did not make any effort to utilize them but now the same country is on top of the world and is the leader in the economic sphere. Similarly, Siberia, in the North of Asia was regarded as a completely backward area and it was thought worthless from every point of view. But now with the efforts of Russians, this area has become absolutely different and holds out a great promise for the future.

The environment of man is constituted of two elements :

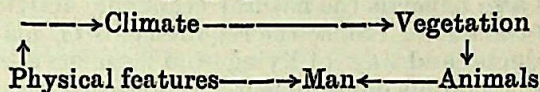
1. **Physical Element** includes geographical situation, frontier lines, physical features, shape and size, coast lines, rivers, climate, presence of natural resources like minerals, forests and fishes.
2. **Cultural Element** includes races, religions, system of Government, density and distribution of population.

Physical Factors—Physical factors include land and water as it exists on the surface of the earth, climate and the resources that lie under the earth. Climate is the most important of all these factors. It includes temperature, rain-fall, direction of the wind, speed of the wind, humidity, etc. The land and water as distributed over the surface of the earth also mean by implication the shape and size of the country, the natural configuration of a region, drainage, the type of coastal line, etc. The resources that lie under the earth are mostly minerals but we can also include therein the agricultural and forest resources of a place. All these physical factors are provided by nature and man has to utilize them in the best possible way.

Cultural Factors—The cultural factors are born of the activity of man in a society. Time and place have a very clear effect on these factors and races, religions, political set-up, Government, population etc., are some of those things which determine whether man in a particular region will be able to utilize the resources given by nature and if so, to what extent and in what direction.

Geographical Factors—Physical features, climate, vegetation and animals are the main factors which go to influence the activities of man. The type of land surface, drainage and climate determine the kind of vegetation that a region will have. And according as the vegetation is so will be the animals found in that area. As a matter of fact all these factors are inter-related and

they form among themselves the geographical control over man.



4. ENVIRONMENT AND ECONOMIC ACTIVITIES

The fundamental requirements of man are food, shelter and clothing. He wants certain conditions to be fulfilled before he is

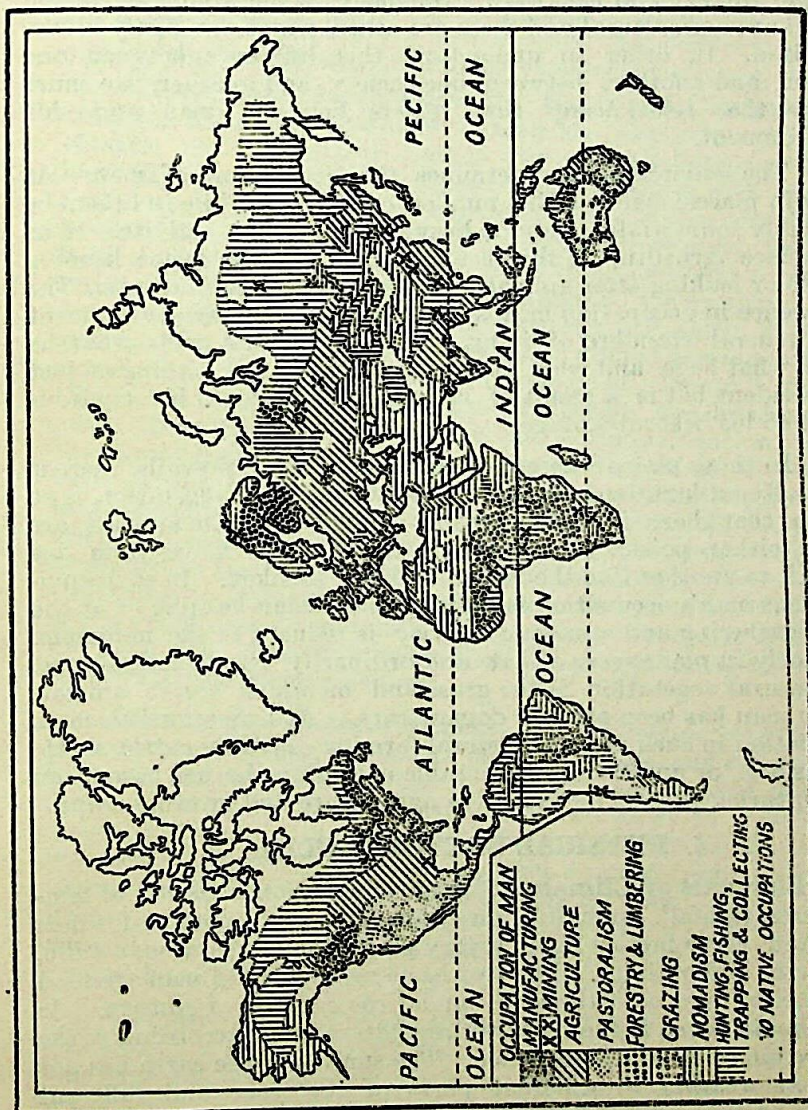


Fig. 1 Environment and Human Occupations

able to make a living in any region. Further, man is a social animal and he wants to live in company with others who are like him.

This requires means of transport and communication and on this also depends the natural economic activity known as trade and commerce. Since the requirements of man, his temperament, products and way of living and even the economic development depends on his environment, we find that the different regions of the world are at different stages of economic well-being. In certain regions, the people are active, progressive, hard-working and skilled traders while on the other hand in certain other regions, people are lazy and backward. Similarly, some countries of the world are agricultural and there are others which are highly industrialized. In order to understand this difference between one region and another, between one society and another, we must know the relationship that exists between man and his environment.

The environment determines the occupation of man. At certain places, man is still a hunter or gatherer while in others he is highly industrialized and is busy in commercial activities. If at one place agriculture is the occupation, at another place keeping cattle or looking after animals is the chief occupation of man. The difference in occupation means difference in economic development and general standard of living. Thus the life of a man—what he does, what he is and what he has become—is not a thing of just an accident but is a result of his struggle to mould his environment to his best advantage.

In those plains where hot and moist climate prevails, there is very often a luxuriant growth of vegetation. The vegetation is so dense that there is a struggle for sunlight and the animals are often either poisonous insects or those which move from one branch to another like the lizard and the monkey. In such environment man's occupation is nothing more than hunting or at the most gathering and economic activity is reduced to the minimum. Similarly in plain areas of hot and ordinarily less moist climate, the natural vegetation is the grassland on which thrive animals which man has been able to domesticate. And therefore his main occupation in such areas is pastoral farming—herding cattle, sheep, horses etc., or under more favourable conditions he has become an agriculturist, practising extensive agriculture and growing crops.

5. PHYSICAL FACTORS—CLIMATE

Elements of Climate—Climate of a region consists of temperature, rainfall, humidity, direction of winds, velocity of winds etc., and these factors have a very great influence on man's life, character and activity. The two basic necessities of man are food and shelter and both these are under the control of climate. As the climate is, so is the natural vegetation and accordingly the occupation of man is determined. The surface of the earth has got different weather in different parts of the year and different regions have got different conditions of temperature and rainfall. The climate of one latitude is different from that of another and

accordingly man's habits are also different. Although man is very adaptable by nature but still we find that the people of different climates have got different types of dress, food and housing.

Climate has a direct effect on man's food and shelter. Climate determines the vegetation of a place and vegetation determines the animals that are found in a region. The effect of all this is that certain very hot and dry areas or certain very cold and dry areas are absolutely useless for the habitation of man. Not only this but man's trade, the style of construction of his houses, the habit and style of taking food are also determined by climate.

Climate and Man's Customs, Habit and Character—The customs, habit and character of man are also influenced by the climate. In the tropical regions due to high temperature and humidity, man is lazy, indolent and contented with whatever little he gets. He has a philosophic attitude to life. On the other hand, in the dry and cool climate of temperate regions, people are bold, courageous, adventurous, hard-working and have a very progressive outlook. According to Huntington, the optimum temperature for ideal creative human activity is round about 50 to 60°F. and the best type of conditions are found where there is a daily and seasonal change of temperature. This type of climate is invigorating and it is in those areas that civilization has developed the most. If we look at the history of the world civilization, we find that world leadership has been determined by climate. Over the years with the expansion of culture and civilization, the world leadership has been progressively moving towards colder areas and whenever there has been any decline of civilization, it has gone backward to the warmer areas towards the South. There is another thing to be taken into consideration that the first civilization of the world came to maturity in the warmer areas but soon they declined and leadership passed on to people in areas having temperate climatic conditions.

Climate and General Fitness—The most important factor is the influence of climate on man's physical fitness and his capacity for work. It has been estimated that the best type of temperature for human work ranges between 38°F to 60°F. In regions where the temperature is higher, people are normally lazy, slothful and cannot work as much as their counterparts can do in cooler climates. Nowadays, this factor has also been brought under control to some extent by the inventions of air conditioners and coolers. But they are so much limited in use that their effect is not felt by the masses and the people in general.

Climate and the Way of Living—Climate also determines the dress of a man, the food that he eats, the way he builds his house and the way he takes his food. People in Arabia are always in the habit of wearing long loose flowing robes while people in North-Western Europe put on close fitting shirts and trousers. Similarly, while in cooler European countries, people take their

food on a table, in warm regions of India, man likes to undress himself and then take his food by squatting on the floor. In cold areas, the houses are built with very few windows and are covered from all sides while in hot tropical countries, the houses are constructed so as to leave more of open space and the terrace is a necessity. Similarly, in dry and hot desert regions, the houses are of stone with flat roofs while in hot and moist areas of South East Asia, houses are made of wood, at a certain height from the ground and have sloping roofs.

Variations of Climate and Different Ways of Living Among Men of Different Lands—In those regions which are near the equator, the temperature is throughout very high and there is a lot of humidity in the atmosphere. It rains almost daily in the afternoon and the climate is very hot and wet. In this type of climate, there is luxuriant vegetation and the land surface comes to be covered with very dense forests. In these forests, the plants struggle for sunlight and the ground underneath is covered with marshes of decaying vegetation. As such, the animals found in this area are such as live on trees or can fly in the air. The result is that men in these regions build their houses on the branches of trees and their occupation is hunting or gathering. They move from place to place in search of roots, fruits, hunt animals or catch fishes. Due to high temperature they remain mostly naked and do not wear anything. They only cover the private parts of the body with leaves of trees. The population is very sparse and the people are short-statured, lazy and hate hard-work. Thus people are dependent on nature for everything and their culture is nothing but as nature makes them. They do not know how to cultivate the ground, how to prepare clothes and not even how to build their houses.

As we move from the equator towards the poles, we come to the tropical, sub-tropical and temperate regions. We find that the climate is improving and accordingly the people also are more intelligent, more hard-working and possess curiosity to know new things and adopt new methods. In the hot desert regions, there is a great range of temperature—days are very hot and nights are very cold. There is no vegetation and for miles and miles one can only see the sand in such regions. There cannot be any settlement because even drinking water is not available. The only animal found in these regions is the camel which can travel without water for a long distance. These conditions have affected the life of man also and man in these regions is either a robber, looting the caravans moving from one side to the other or he is busy transporting goods from one end to the other by keeping a flock of camels. Where water is available, man has settled down to some agriculture and animal husbandry. The houses made in these desert areas are made of stone and have flat roofs because there is no danger of rain water flowing over their roofs. Because of the clear skies and as a result of watching the stars in the sky, man

in the desert areas has been the first to contribute to astronomy and mathematics.

In the Tundra regions towards the extreme north, the climate is extremely cold throughout the year and the earth is covered with snow all the year round. Even the water under the earth remains frozen. No animals except those which bear fur, are found here. Reindeer, squirrel, bear and fox are the usual animals. These have no commercial value and, as such, there is very little population here. The density of population is seldom more than five people per sq. mile. The people of this area—Eskimos, Lapps, and Samoyeds are all short-statured and their main occupation is hunting and fishing. They depend on the flesh of the animals that they kill, wear the skin of those animals and burn their fat. They are at a very low stage of civilization and gradually with the help of Canada and Soviet Union, they are now being civilized. In order to ward off the cold winds and low temperature they live in small houses which look like a bath-tub turned upside down or in tents made of animal skin. Their food, abode and dress all show the effect of environment in which they live.

Climate and Transport—The mode of transport, terms of trade and the localization of industries are also determined by the factors of climate. In areas of heavy rainfall, the road transport is absolutely useless, railways cannot be laid because the tracks may be washed away and the rivers are over-flooded so that it is dangerous to ply boats over them. In very cold areas, most of the rivers get ice bound in the cold months and as such transport over them is determined by the factors of climate. The air transport is directly dependent on weather conditions because whenever there is a dust or thunder-storm or there is fog or mist, flights cannot take place. In hot dry deserts, the moving sand-dunes and the violent dust-storms are a great impediment to the means of transport.

Climate and Trade—The factors of climate determine the trade—its composition as well as the direction. As the climate so are the products and accordingly it is determined what a country will be able to export to others and what it shall import because it does not grow that at home. Different regions have got different products and the needs of people are also different. In order to fulfil these needs, man begins exchanging goods and thus international trade takes shape. If we look at a world map, we find that the climatic regions are arranged in belts running from east to west, and the direction of the trade is from north to south. The route that the trade will take is also determined by climate. International merchantships always avoid those routes which are frequented by storms, gales or other sea disturbances. Shipping routes also avoid those parts where icebergs float or fogs occur.

Climate and Localization of Industry—The localization of industry is also conditioned by factors of climate. The cotton

textile industry tends to localize itself in areas of moist climate; woollen manufacture, and flour milling tend to be established in dry areas. Cinema film industry requires open skies and plenty of sunlight and therefore it is usually found in areas enjoying Mediterranean type of climate. Similarly, printing and paper industries are conditioned by climatic factors. The needs of the industry are, however now-a-days also being fulfilled by science and Technology. But, the market for a particular type of industry and its product is absolutely a thing of climate. The cotton textile industry has progressed in the tropical areas everywhere because the people of those areas like to wear light cotton clothes. India has not been able to develop a woollen industry because here the people need woollen clothes for hardly three months in a year and that too in the northern part of the country. Thus, market which includes the demand and the taste of the consumers is a thing which is directly related to climate and in order to assess it, we have to study the climatic conditions of a particular area.

6 PHYSICAL FACTORS—SITUATION

The geographical location of a country is of great importance. The situation has a great influence on the development of trade and commerce. The situation of a country is either continental or littoral. A place can be situated on an isthmus or on an island or in a peninsula. Russia, Poland, Bolivia, Switzerland and Czechoslovakia are examples of continental situation. These countries are situated in the heart of the continent, at a great distance away from the main sea routes of the world and have, therefore, great difficulty in coming into contact with the economically developed regions of the world. Afghanistan is also a land-locked country and it is seen how it has to depend on its neighbours for its trade with other countries. Norway and Sweden are situated right on the sea-coast and they are easily approachable by the world sea routes. Great Britain and Japan are examples of insular situation while Italy and India represent samples of peninsular situation. In the case of these countries, the presence of sea on all the sides or on three sides is of great help to trade and commerce.

Frontiers—The situation of a country includes the relationship of that region to its neighbouring countries, the types of routes that connect it with other parts of the world and the type of frontiers that separate it from its neighbours. The frontiers are normally of two types—natural and artificial. Sea, mountain desert and rivers form natural frontiers. In the case, of these the countries have no problem of security and territorial integrity. India is separated from the rest of Asia by the great Himalayan chain, which rises to a height of several thousand feet and the result of this has been that India has come to possess a feeling of independence so much so that it has ever been recognized as a separate entity, and has even been called a sub-continent. Great

Britain is surrounded by seas and although English Channel, which separates it from Europe is only a few miles broad, the people of great Britain have never been affected by what has happened on the continent of Europe.

The artificial frontiers are mostly over the land and they are determined by historical factors, peace treaties, wars and mutual agreements. Most of the countries in Europe have such frontiers and their position has ever been changing over the period of years either due to wars or otherwise. As a result of this change of frontiers, there is often a great difference in trade and commerce. But there is an example of U.S.A. and Canada, which have artificial frontiers but there have been no difficulty between the two countries. As a matter of fact differences over frontiers arise due to lack of understanding. If there is a mutual understanding and an attitude of respectfulness for the rights of others, such problems will not arise at all.

Accessibility—If a country is situated at a place where it is easily approachable from all sides, there is a quick development of its trade and commerce. Great Britain is a very clear example of this. Japan is also situated in an ocean. Because it faces Asia on the one side and the western coast of America on the other, it is not so favourably located as Great Britain is which has on one side the highly industrialised region of Europe and on the other the highly developed industrial part of the U.S.A. This is further illustrated by the fact that the Atlantic Sea Board of the U.S.A. is developed much more than its western coastal area which is on the Pacific Ocean. The former faces Europe while the latter faces Asia which is not very developed. India is also ideally situated in the centre of eastern hemisphere and it is equi-distant from all parts of the globe. Standing at the head of the Indian Ocean and surrounded by seas on three sides, the location of India is ideal from the point of view of trade and commerce. It was because of this situation that India became the leader of the world in the past and there is no doubt that it will become the leader of Asia-Africa in days to come.

For the economic development of a country, it is very necessary that a country must be so situated that it can easily come in contact with other parts of the world. Close contact with other nations and facility of reaching the place is helpful in bringing about economic development. Italy does not possess many raw materials but due to its being situated near the industrialised countries of Europe, it has also become a great industrial nation. The most important example is provided by Malaya and Indonesia where equatorial climate prevails but in spite of that they have developed so much because progressive peoples could approach them easily by sea from all sides. In the absence of these facilities, regions of similar climate like the Congo basin in Africa and Amazon basin in South America have remained backward. Coming nearer home, we can see that the Bombay region of India

has developed the most because it came in the closest contact with the west, being nearest to Europe. Similarly, the north-eastern part of U. S. A. have developed the most because it came in direct contact with highly industrialised Europe which it faces across the Atlantic and from where she got inspiration.

Physical Setting—In the countries which are situated by the side of a sea, people become good sailors and fishermen. Norwegians, Japanese and English people are characteristic examples. In England and Japan, there has no place which is more than 200 miles from the sea. This has made the people adventurous and enterprising and has given them ability to take risks. This is further illustrated by the people of South China, who are more likely to go abroad and settle in far-off countries as against their fellow countrymen in the interior valleys, who want to live there alone and are conservative. Countries which are surrounded by mountains or by other countries are often poorly developed for want of natural outlets. The natural resources are not utilized properly. The character of the people of such countries is also backward, suspicious and their ideas about themselves are more than normal. Mongolia, Bolivia and Sudan are the best examples in this connection. It is very seldom that countries which are surrounded by mountains from all sides develop as Switzerland has done. Mostly such countries remain dependent on others and are rarely developed to the extent as others are. There is another drawback in the people of such countries. Such people remain ignorant of the progress and achievement of others. They do not know what is happening in other parts of the world and they may be compared to frogs in the well.

7. SHAPE AND SIZE

Shape—The shape of a country has a very great influence on the economic development of a country. The shape may be compact, linear or distorted. Russia, Rumania and India are examples of compact land masses. Chile in South America is a country with linear shape. Greece is example of a country which has distorted land mass. In the linear shape of a land mass, the country has length only but there is no breadth. In this type of country population spreads length-wise and the pattern of settlement is very much like that of the islands. Honshu, Japan's main island, Malaya and Chile are such countries. In such a type, the people may be conservative or very forward and energetic. If the population increases in such type of countries, there is often a migration. Besides, the length-wise expanse of such countries is a great hinderance to agricultural activity because the climate changes extremely from one part of the country to the other, and as such agricultural operations have to be without any uniformity.

Compact Shape—In countries having a compact shape, there are better facilities for the development of the means of transport and there is a greater element of national solidarity.

The exploitation of natural resources is also easier because of the compactness. United States of America, Soviet Russia and India are the examples which prove the point that in such countries not only better means of transport can be developed but also location of industries, mining of minerals and production of agricultural crops becomes easier.

Distorted Shape—In countries having distorted shape, the coast lines are often broken, and sea enters in those incisions. As such there is a greater advantage of water transport and also under such circumstances people become adventurous sailors. But as far as distribution of commodities and exchange of ideas are concerned, there is often a great difficulty. However, countries having this type of shape but with a better location have developed very much as Great Britain and Japan but another country of this type, Greece has remained backward.

The size of a country also plays a very important part. Some countries are very vast and normally countries having more than 10 lakh sq. miles of area are called huge. The countries which have an area of more than 1 lakh sq. miles but less than 10 lakh sq. miles are known as big countries. Countries having an area of more than 40,000 sq. miles but less than one lakh sq. miles are known as medium-sized countries. Those having an area of less than 40,000 sq. miles are known as small countries.

Size of a Country and its Population—The size combined with the number of people who live there determines the type of economic activity that a particular region will have. In a small country with the growing population, it is difficult for the people to continue depending on land or agriculture. In such countries, people first change over to intensive cultivation but after all there is a limit to the capacity of the land and activity thereon. So the people are forced to take up other means of earning their livelihood. In such countries very often internal trade and agriculture is replaced by foreign trade. Great Britain, Belgium and Japan are such countries where industries and foreign trade have become the most important mainstay of the people. Very often, with the growth of population in small countries, they are led on to grasp other neighbouring countries so as to find more land for their people and more markets for their goods. History tells us that this was the main background of the war-like intentions that made Germany, Italy and Japan attack their neighbours. Sometimes, the growing population forces the small countries to take recourse to migration and the history of Europe in the 19th century clearly illustrates how after the industrial revolution, Europeans started moving out of their countries to different lands. That was how Canada, U. S. A., Mexico, Brazil, Argentina, South Africa, Australia and New Zealand come to be colonised.

In those big countries where the population is small, people are often interested in agriculture and pastoral farming. These

countries practice extensive agriculture, take recourse to mechanized farming and are often the suppliers of commodities to the world at large.

But, there may be big countries with a large population. India and China are examples of over-populated big countries. In these places, production always falls short of the demand of the people and whatever expansion takes place in the production of commodities at home, it is consumed by the growing population and very little is left for foreign trade or export. As such there is a continuous struggle to be self-sufficient and to raise the standard of living of the people.

Size of a Country and Economic Development—There is another aspect of this problem of the size of a country. A country which has large area has better facilities for the development of agriculture and the occupation of the people there naturally comes to be agriculture. U. S. A., Soviet Union, China and India are clear examples. In all such countries population grows fast and they soon come to be thickly populated. On the other hand, countries having small size often have low status among the countries of the world. Although, there are exceptions to this rule as in the case of Switzerland but more often than not the past history is that such countries cannot play a prominent role in world affairs. Bolivia, Peru, Hungary, Rumania and Afghanistan are very important examples. They remain economically and commercially backward and are always dependent upon others for their well-being. This dependence may sometimes even lead to their exploitation by the bigger powers. But as has been said earlier, there are exceptions to the rule. Great Britain and Japan do not have a large area but in spite of their small size and limited natural resources, they have developed economically because their location and other geographical conditions are favourable.

8. PHYSICAL FEATURES

Physical features of a country exercise a great influence on man and his economic activity. Physical features include the formation of the crust of the earth, coast line and drainage. The crust of the earth consists of three important features. They are mountains, plateaus and plains. These influence man in transportation, agriculture and the occupation which will give him his livelihood. As a matter of fact, the system of life is shaped by the type of relief.

Man and Mountains—In a mountainous area it is often seen that there are difficulties in the establishment of towns and cities. Mountains put obstacles in the way of movement, distribution of population, laying of roads and railways. Trade and commerce in mountainous areas is also very difficult and backward with the result that the people are poor and economically undeveloped. The density of population in mountainous areas is also not much. The mountain slopes are used for agriculture and at many places,

the slopes are cut into a stairlike arrangement and by this method of steps, agriculture is carried on and maximum advantage is taken of the water as well as land. Mountain slopes normally have a thin layer of soil and this soil consists of stony and rocky blocks. Therefore, there is a difficulty in ploughing the land and often very great labour is required. No machinery can be used and most of the work is done by hand. As such modern agricultural methods are useless in such areas.

Difficulties of Life—Often on the mountains, forests are found and these forests are full of wild animals. Therefore, the people of these areas have on the one hand to cut down the trees and on the other they have to protect themselves against wild animals. In this process, they become hardy, stout and brave. They have to work hard to get the basic necessities of life, and if they develop, it is after a very great effort. The people of mountainous areas are often backward in their culture and their way of life is not so polished and refined as those of civilized societies. The people of Nepal, Scotland or the people living in Arakan Yoma in Burma or those who live in rocky mountains in America are very clear examples of this fact. In mountainous countries one has to work hard for one's existence. He has to be alert and there is a continuous struggle with environment.

Facilities to Life—But the mountains are not always only obstacles to economic development. Mountains often bring a great advantage to the people. Some of these advantages are apparent while most of them are indirect. Mountains increase the quantity of rain-fall, give rise to rivers and keep those rivers full of water all the year round. The mountain slopes are wonderful pasture grounds for cattle and sheep. The forests that are found on heights yield valuable timber and in cool temperate regions they are the source of soft-wood pulp. Besides this, the climate of mountainous areas is good for health and the areas are rich in scenery. Therefore, there is often a rush of people for the sake of health and sight-seeing. Mountainous areas have often a number of water-falls and thus are the sources of hydro-electric power. Minerals are also found in these areas and therefore the occupations of men in such areas is mining, lumbering, hunting, pastoral farming or subsistence agriculture i.e. for the sake of one's own self and one's family

Influence on Character—Lands in mountainous areas are after cut off from the rest of the world and the contact with other parts is difficult. The people of these lands are therefore, mostly conservative and traditional. They are honest and true. They can work hard and sincerely. The people are intelligent and wherever they have got facilities, they have developed into very good economic societies. Switzerland is a very important example of highly developed mountainous society.

Man and the plains—Plains have all the facilities required for the development of man's economic life.

1. Facilities for Human Settlement—Plains occupy about one quarter of the land surface, yet they offer home for more than 90% of the people of the world. Wherever proper conditions of climate and soil exist, people usually settle there. The economic activities of man are greatest on the plains because of many advantages available there. A little more than 75% of foodstuffs are raised on them. Ease of transportation and facilities for agriculture are other advantages. Plains are, therefore, the most thickly populated parts of the world. But there is one great disadvantage in the plains. Facilities of easy communication offer easy passage to invaders.

2. Facilities for Agriculture—Level land and deep soil facilitate agriculture. The principal agricultural belts of the world are confined to those plains which are made by rivers. Where plains are dry, irrigation tends to make them very fertile.

3. Facilities for Communications—Due to levelness of relief it is easy and profitable to construct roads and railways on plains. More than 85% of the world's railways lines are found in plains. Rivers flowing in plains are slow—an essential quality for navigation.

Some plains are not useful to man. Plains with bad climate, poor drainage, and barren soils are inhospitable to man. Bad climate may be too hot, too cold or too dry, Amazon Basin and the Belgian Congo have too hot and too wet climate. Siberian plain and north Canada are too cold. Sahara is too dry for human settlement. Bad drainage makes the plains swampy and unfit for man, though in some plains soil is unproductive.

Plains and Economic Development—If we study the history of economic development in the world, we find that plain areas have developed the most or man has been seen to progress utmost in those plains of the world where temperate grasslands existed. Such areas are Prairies in North America and Campos and Lanos in South America, Steppes in Siberia and the Downs of Australia. Normally, world civilizations have progressed in those plains which are also the river valleys because rivers helped them by supplying water for drinking as well as for irrigation and they could also move from one place to another over these rivers. Therefore, culture developed, civilization advanced and the river valleys of the world came to be 'cradles of world civilization'.

Occupation of the people in the plains is agriculture, trade and commerce and industry where raw materials are easily available.

Man and Plateaus—Plateaus, on the whole, have hard rocks and poor soils. Consequently they are unfavourable for agricul-

ture or human settlement. If the rainfall is heavy, plateaus become highly dissected. The rugged topography is unsuited to easy communication and agriculture.

But volcanic activity in some plateaus has brought out basaltic lava from the interior and basalt weathers into good soils. The black cotton soil area of India called Deccan Plateau is such a favourite place.

Some plateaus contain many valuable minerals. Chota Nagpur Plateau of India is described as "the Store house of strategic minerals". Almost inexhaustible reserves of bauxite, 80% of quality mica, chromite, vaolin, coal, gold and copper occur in this plateau. Such plateaus offer good chances of prosperity. In similar plateaus of Europe various industries have been set up.

9. PHYSICAL FACTORS—COASTLINE

Location of Coast : Physical Factors—Coastline is also a physical factor which influences man's economic activities. The coastline of a country is determined by three important factors : action of sea and other denuding agents, crustal movement, and the rock structure. These factors are responsible for determining various types of coasts, but to be of commercial value the coastline should be greatly indented so that no part of the country is far off from the sea. Broken coastline has many advantages :—

1. It affords protection to ships from the tyranny of waves.
2. It allows ships to reach far into the interior of the country.
3. It affords facilities to the development of ports and harbours which contribute to the easy exchange of goods and thus indirectly help in the growth of industry and commerce.

One great cause of the greatness of British Isles is her long and broken coastline. Great Britain has a coastline of about 2,400 miles which means about one mile of coast for every 18 square miles of area. Japan also has a long coastline which accounts in part at least for her commercial and industrial greatness.

Seaports are the gateways to, and the outlets of the production of regions. By their constant association with the sea, people become adventurous and enterprising. It is because of their broken coastline that the Dutch people have become a commercial nation. On the contrary, regular coastline of a country hinders the construction of good ports and trade and commerce of such a country has to suffer. The actual position of a port depends on two factors: the existence of a natural harbour, and ease of communication with the area served by the port (or Hinterland).

The coastline can be straight or indented, high or low. From the point of view of trade and commerce, the coastline should be indented so that sea may enter into the interior. Such indented coastlines are often very good sites for the development of ports and harbours. Great Britain and Norway have developed ship-building industry and trade and commerce only because of their indented coastline. Because of this very factor, Dutch people could progress so much in the world trade. But indented coastline only cannot do anything unless other geographical factors are also favourable. That is why in spite of indented coastline, the Greeks have remained backward. The countries which have a straight coastline often have difficulty in developing ports and harbours with the result that trade and commerce on the one hand and industries on the other hand cannot progress. The coast line must also be well protected from high winds and breaking waves. Africa has not been able to develop any good port or harbour because of this factor only. But it does not mean that it is sufficient to have only an indented coastline. If the coastline is indented but mountainous, the advantage gained will be nullified as has happened in the case of Norway and Greece.

Coastlines, their nature and extent, also determine the area of contact with the outside world. It also reveals how man will be able to send his goods outside, develop foreign trade and come to have an adventurous and enterprising temperament.

10. WATER BODIES—SEA & RIVERS

Significance of Water in a Country's Economic Life—
Water plays a very important role in the economic life of a country.

The area of the total earth's surface is about 200 million square miles, out of which about three-fourths is covered by water and only about one-fourth is land. The average depth of water is about 17,000 feet. It means that the total volume of water in the ocean basins is so great that if the surface of the earth were made into a level plain it would be covered by a regular layer of water about two miles deep.

SEA

The sea plays an important part in feeding the world's people. The sea fisheries provide good food for millions of people in many parts of the world. Men gather harvests from sea as well as from the land. But on seas there is no need to cultivate and wait for the maturity of the crops as in agriculture on land. All that one has to do under fishing is to go with a net and wait a while. Seas offer abundant and an almost inexhaustible source of food supply. The abundance of fish as food source will be understood properly if we know the wonderful capacity of the fish to multiply its numbers. Gibbs provides us the approximate number of eggs laid by the important fish varieties.

Annual number of eggs laid by fish

Variety of fish	Approximate No. of eggs.
1. Ling	18,500,000
2. Turbot	8,000,000
3. Cod	4,500,000
4. Plaice	300,000
5. Herring	32,000

The above table suggests that fishing industry has a great future. Another important point to be noted in the future possibilities of this industry is that there are still vast areas in the sea which can be made to render great yields comparatively cheap. The capacity of some areas in the sea for fish production has not yet been tested.

Besides fish, the sea provides a number of other useful articles. Fils and fats, sea weed for food and medicines, coral for beads, sponges, pearls, furs and skins and salt from salt water we get without cultivation.

The water bodies give employment not only to large number of fishermen, but to others who work ashore in shipyards, rope works, engineering shops, in places where ships and their gear are made, in packing, canning and fish food business.

Distribution of Commodities—Sea plays a very important part in the distribution of commodities to the market. Water routes are the most important means of transport both in respect of route mileage and the total tonnage carried by other sources. Ships hold more than trains do. Secondly, the sea-road is free to all and it carries no cost of upkeep except where great ship-canal link ocean to ocean. The ocean highway is of vast importance in world communication and trade. Prof. Russell has rightly observed that "The nation that does not touch the ocean is like a house that is not upon the street, and some of the bitterest strifes of history have been fought for the possession of its coast".

Ocean routes are always primarily determined by the availability of cargo. There are six great streams of traffic which are fed by smaller ones and inland waterways. The world's inland waterways carry an enormous amount of goods.

Tempers the Climate for Economic Activities—Sea tempers the severity of climate and thus creates favourable conditions for the healthy and invigorating climate. Everybody knows that land is much more quickly heated than water in the same latitudes. Not only that, land parts with its heat much more readily than water. Consequently, lands are colder in the same latitudes. It is clear, therefore, that the countries near the sea

enjoy much more favourable conditions for work than the countries far from the sea. Summer temperature in the British Isles is about 13° F less than in Russia; while the winter temperature of British Isles is 33° F more than in Russia. The following table will clearly illustrate it.

Temperature changes in Relation to Distance from the Sea

Towns	Valentia.	Hanover	Berlin	Warsaw	Saratov
July temp.	59.0°F.	63.1°F.	64.6°F.	65.8°F.	72.1°F.
Jan. Temp.	44.6°F.	32.7°F.	31.3°F.	25.9°F.	11.5°F.
Annual Range	14.4°F.	30.4°F.	33.3°F.	39.0°F.	60.6°F.

RIVERS

Rivers are important historically, politically and economically. Rivers influence the land through which they flow and the sea in which they fall. The history of the Caspian sea is nothing but the story of the Volga river. As a matter of fact, Mediterranean sea could not develop very much because except for the river Nile and the river Danube, no other big river falls in the sea. Atlantic Ocean has developed very much and has become the centre of world commerce only because very important rivers come and fall in it from east or west. As against this, the Pacific Ocean has not been able to develop very much because no great river falls into this ocean.

Rivers have played a very important role in helping man's progress and civilisation. They are a great source of the life and activity of the people. The four great river valleys—the Nile, the Tigris-Euphrates, the Indus-Ganges, and the Hwang-Ho-Yantze Kiang are the cradles of civilisation. Rivers help in the irrigation of land and thus create a sense of security in the farmers. Supply of water to the crops becomes certain and regular. Not only that, with the help of irrigation cultivation becomes possible during the whole year and valuable crops can be grown in place of inferior ones. Supply of moisture to needy plants is of very great value.

Rivers fertilise the valleys through which they flow. During floods new silt is deposited. That is why all kinds of crops can be grown on the river plains. We, in India, fully understand how soil and manure both are supplied to our country by these rivers. Little wonder that Egypt is called the gift of the Nile. Without it, Egypt would have been an extension of Sahara Desert. But now she grows cotton, wheat, tobacco and fruits extensively. So is the case with many other countries.

Rivers also furnish cheap water transport for all the wealth of the valleys through which they flow. They are called the "flowing roads". They prolong the great ocean routes into the

interior of the country. To serve as agents of distribution and exchange of goods, rivers should have four important characteristics—

1. They should be free from ice in winter. In Russia and Canada all transport is blocked in winter because rivers there become ice-bound in that season.
2. They should be deep enough for the steamers plying in them.
3. They should have no rapids and falls.
4. They should not get dry in summer.

Rivers supply water for drinking and domestic purposes and determine the location of towns. Delhi, Agra, Kanpur, Allahabad and many others are the important towns which grew and progressed on the bank of rivers. Many examples can be cited from other countries.

Water of the rivers can be harnessed to generate hydro-electric energy. Output of the energy depends on the supply of water and the fall of the river. Consequently, the countries with regular water supply but with irregular relief are best suited for generating water-power.

Rivers furnish abundant water with particular quality, to some industries. The jute industry, paper industry, woollen industry and flax industry are examples of such industries. Jute, flax and woollen fibres require large quantities of water which is free from lime. Paper industry also demands pure water in abundance.

Rivers as Natural Frontiers and Means of Communication—Rivers are also useful boundaries between nations. In those countries where long rivers flow, they produce national solidarity between the different parts of the Kingdom. Rivers are also very useful means of communication and wonderfully cheap means of transport. They provide water for irrigation and by holding their water, hydro-electricity can be developed. But in order to be useful, rivers must be perennial in their flow and open all the year round. They must flow in a direction which is economically beneficial for the country. In Canada and Soviet Union, there are several rivers which either move into inland seas or fall into the Arctic ocean which is ice-bound for 9 months in a year. As such they are useless for man and do not provide any economic advantage to the regions through which they flow. In order that a river is able to influence man's activity and man is able to take advantage of it, it should be free from ice, sufficiently deep, full with water all the year round and free from rapids and water-falls in its course. Besides being used as means of navigation and irrigation, rivers contribute to the fertility of the soil of the region through which they flow. The plains of the rivers

receive the new soil and every year the flood plains are over-laid with newer alluvium. Had there been no Nile in Egypt, most probably that country would have been a desert like the rest of Sahara. That is why Egypt is known as the 'Gift of the Nile'. Rivers, thus, enrich the land over which they flow and provide facilities to man for his economic development.

11. PHYSICAL ENVIRONMENT & HOUSING

Housing in Mountainous Areas—Environment influences man in the way he builds his house. In mountainous regions, the material used for house building is generally such as is found in the locality. Ordinarily people use stone slabs and logs of wood and the buildings are made in such a way that they offer protection from cold wind. On the slope of a mountain, the site selected for house building is generally such that one of the walls of the building is the mountain itself because in this way the cost of construction is minimized. Of course, now-a-days due to facilities of transport and communication, building materials of all types can be brought to the hill areas from the plains. Therefore, other types of buildings are also being constructed but they are very expensive to construct as well as to maintain. The buildings constructed in various hill areas are usually single-storeyed and are thatched with slate roofing because the water of the heavy rainfall must be allowed to fall and run off quickly.

Housing on Plain Areas—On the other hand, in the plains the buildings may be constructed in any way according to local requirements. Building material is easily carried but still the influence of environment is very clearly seen. In West Bengal and the Ganges deltas, walls of houses are made of mud and roof is thatched with straw because such type of construction can stand high temperature and heavy rain-fall. The materials used are such as are available nearby but where man has been able to spend money and bring materials and engineering skill from outside, he has built palatial buildings which attempt to defy the effects of the environment and nature. As we move from east to west, the shapes and types of buildings change. The houses are so designed that they are able to shelter the people living in them from the vagaries of weather and climate. In the areas that lie to the east, the buildings face the south. As we move to the west, the face of the building is turned more and more to the east and they are covered with tiled roofs. According to the direction of the wind, the facing of the building is changed and adjusted. As we move further to the west where there is dryness as well as more heat, the roofs are not tiled but they are made of mud. The advantage of mud roof is that it keeps the room cool when the temperature outside is very high. In places having mild range of temperature as in the mid South India, we find the roofs made of reinforced cement concrete or reinforced bricks. In the countries of the west, where the vagaries of climate are not so apparent and where multi-

storeyed houses are a necessity because of lack of horizontal space, steel fabricated or pre-fabricated houses are the rule.

Housing in Equatorial Regions—In different regions of the world, housing is according to the circumstances presented by nature. In the equatorial forest regions, man builds no houses. They move from place to place, hunting animals and gathering wild produce with the trees as their homes. They build houses only when they wish to settle down for a short time with a view to exchange their produce with those of the outsiders. At that time, they build huts of leaves. The plinth of such huts is usually at a sufficient height from the ground. Where there is mud and decaying vegetation, as in South East Asia, such types of houses are the rule and bamboo is the chief building material used in these types of houses.

Housing in Tropics—In the tropical grassland, homes and dwellings are more substantial structures and they are furnished with grass mats and wicker-work screens. In monsoon-regions the houses are made of bricks but they are so constructed as to get in maximum air when the humidity is high and to protect man from the terrific downpours that come during the monsoon season. In the hot deserts, those people who wander from place to place live in tents but those who settle down to some sort of occupation in oasis build houses. These houses are made with thick stone or mud walls because this type of construction keeps the people inside cool and sheltered from the heat outside. These houses have usually flat roofs because of the absence of rains in these areas.

Housing in Mediterranean Land—In the Mediterranean regions, which have seen in the past the rise and fall of Greek and Roman civilization, the houses vary in their architecture and planning and the building material is used according to the taste and wealth of the people who build them. But still the influence of environment is seen very clearly. Because of dry summers and mild winter rains, most of the houses in this region have a low or flat roof. The buildings are so arranged as to have on the inside a quadrangle with a fountain in the centre. In the towns of this region also, fountains and open squares are the rule. As one moves more and more towards the poles, one finds the housing more and more according to the circumstances in which man has been placed.

Housing in Temperate Latitudes—The people of temperate grassland lived in 'yurts' which were tents covered with felt or leather. These could be easily closed and carried from end to end in Canada and in North Eurasia, log-huts are the usual form of abode of man. In the Tundra or the Cold North, the Eskimos live in the tents during the summer but in the winter they make the houses of snow which look like an upturned canoe with a small opening through which they can enter by lying flat on their bellies.

Thus they do protect themselves from the blizzards that blow in winter.

Housing and Earthquakes and Wild Storms—The influence of environment on housing is also seen in places like Japan where because of earthquakes, the houses are made of thick paper or wood. The environmental factor is also visible in South East China and South East United States of America where tornadoes and typhoons are the usual feature and whenever these blow, they raze everything to the ground. Here the houses are usually made of wood and they are constructed on piles.

Housing in Cold and Warm Lands—The environmental influence on the housing of man will be still clearer if we compare the house man builds for himself in the colder countries with those that he builds in the warmer latitudes. The houses of colder countries, as in Europe, have fewer windows, lower ceilings, and do not possess either any open court-yard or any terrace. In these houses, wood panelling is the normal style. As against this, the houses of warmer latitudes have more windows and ventilators, there is more open space in these houses and terraces are a necessity. The ceilings are usually high and very little wood is used in flooring and walls because in the warmer climate, wood is very soon eaten away by white ants and such other insects. Often, the houses have double doors in order to keep away flies and other insects from coming inside.

12. CULTURAL ELEMENT—POLITICAL CHANGES

Political changes often form a very important force in the economic life of a country. The simplest political change is in the form of Government as happened in China after 1949 or in India after 1947 or as it happened after revolution in Egypt, Iran and several other countries of the world. The change of Government takes place under different circumstances.

Colonization—History of the world shows that powerful countries come to occupy certain regions which are comparatively backward and colonize them. The story of Africa is nothing but a narration of this type of colonization by several countries of Europe. Portugal was the first country to enter Africa and at that time its aim was to get African slaves for sending them to south America and West Indies but gradually the Portuguese settled down there and at present, they occupy about 8 lakh sq. miles of area. Dutch people were the next to come and after that came the British, the French and the Belgians. Numerous parts of Africa were under the control of these European powers for a very long time and the development of natural resources that has taken place in British Africa, South Africa and in Belgian Congo is a clear indication of what might happen when there is a political change of the colonial type. When more important powers come to settle down and establish Government over comparatively backward areas, they exploit resources of those

areas, establish industries and develop markets but the aim is always to keep those colonies as the suppliers of raw materials to the industries at home and build these into consumer markets of manufactured goods of the factories in the main country. There is another example of Japan's occupation of Manchuria and East Indies. During the period of occupation, Japanese people and the Government established several industries in those two regions and that is how Manchuko and Indonesia came to develop their present industrial potential. Formosa or Taiwan also developed in the same way under the impact of the progressive Japanese during the period of occupation.

Another branch of this type of political change is when the colonies of foreign powers agitate for independence and try to become independent from foreign rule. That agitation might either be to get independence from the rule of a foreign power or to establish more democratic traditions by throwing a monarchy. This type of tendency is now-a-days noticeable all over the world and the days of colonialism are past. One by one, the countries of Asia and Africa are getting their freedom and coming to take their due place on the map of the world. When this type of political change takes place, the countries try to nationalise their assets and often bring about liquidation of foreign enterprises in the country. Sometimes internal dissensions also take place as happened in Congo. Nationalization and liquidation of foreign assets is almost a universal policy in all countries that seek freedom but there are some countries where after winning independence, they seek foreign collaboration and with the help of bigger economic powers try to build up their economy. China before 1949 was a very poor country whose resources were most ill-developed but after 1949 with the change of Government there and with the establishment of Peoples' Republic, it began to march forward from one stage to another and it has brought about revolutionary changes in its agriculture and established industries which nobody ever thought China would be able to do.

Annexation and Separation of Territory—The second kind of political change occurs when there is a shift in the territory and expanse of a country. The best type of example is presented by the separation of Burma from India in 1937 and the division of India and Pakistan in 1947. Besides these, the division of North and South Korea along the 38th parallel, the breaking up of Indo-China into several independent kingdoms and the reduction of the empire of Japan and Germany after the world-war, are other examples of this type. In 1937, Burma was separated from India and this meant about 2 lakh square miles of area lost. Economically it meant something more because after that India became deficient in rice and valuable resources of timber, specially teak. With the separation of Burma, India could no longer enjoy the valuable resources of tin, petroleum, lead, copper and wolfram, which it has to import from abroad now.

Separation of Pakistan in 1947 meant loss of one-fourth of India's total area and the separation of about 80 million people. If India lost the canal colonies of Sind and Punjab which were very good suppliers of wheat and cotton and Ganges delta which produced the best quality of jute, the new country of Pakistan had to begin from a scrap as far as industries were concerned. India, after that, began to fall short of raw materials. Indian textile industry and Indian jute mills had to look forward to Pakistan for raw cotton and raw jute supplies. India also lost very good sources of hides and skins, rock salt and petroleum. Besides, India lost a very flourishing market of about 80 million people.

After 1947, there also came a definite change in India's trade relations. Before that year, most of India's trade was with Great Britain and other countries of the Commonwealth, but now its trade is growing with the U.S.A., Middle-East, Japan, Russia and Central European countries. After the partition, the import of raw materials has increased not only because India lost these resources in Pakistan but also because its demand for these goods is growing with the pace of industries. Now India is trying more and more to export its manufactured goods.

The same story is repeated in the case of West and East Germany, North and South Korea and North and South Viet Nam. West Germany is rich in coal, iron and possesses most of the industries. On the other hand, East Germany was mainly an agricultural area with a paucity of raw materials and in a unified Germany, the two parts were supposed to supplement each other and thus bring about the economic well-being of the whole. But with the formation of different types of political systems in two parts which should have been one, there is a competition to get the better of the other and this competition often takes the form of political ill-will and rancour also as is seen on the Berlin question.

North and South Korea which were indivisible formerly were made into two independent units having two different political systems after 1945. 38th parallel was the dividing line and while North Korea is industrially and minerially more prosperous, South Korea is more well-to-do in agriculture. Had they been together, their economy might have been self-sufficient but at the present moment, they do not depend on one another only but they have to depend on other bigger powers of the world under whose influence they play.

The same is the case with North Viet Nam and South Viet Nam which came into existence after the French power left Indo-China. It would be out of place here to mention the case of Japan where after its defeat in the second World War, 44% of its territory in the shape of the empire was lost and was no longer its own. This no doubt brought about several problems for the country. Not only had the Japanese people to look for new markets

for their goods but also the Japanese immigrants came back to the main land of Japan and the country was faced with a stupendous problem which it did not know how to solve.

Reorganization and Integration of States—The third type of political change is the one which is mostly internal to a country. In that, a country brings about a change in the arrangement or organisation of the units which constitute the political fabric of that country. A very clear example is presented by India and Pakistan again. When Pakistan came into being, it consisted of North West Frontier Province, Western Punjab, Sind and Baluchistan on the one hand and East Bengal on the other. Later on in the interest of national solidarity, those units were merged so as to form West Pakistan out of the first four and East Pakistan out of the last. India also had a very large number of political units enjoying different status at the time of its independence. There were about 600 and odd Princely States which had absolutely no relationship with the British Indian Provinces, where also different units had different status. In 1950, came the integration of the States and six years later in 1956, came the States Reorganization on the basis of language. The aim was to organize the country into such units which were almost equal in size and population and also where people of one language and culture lived. This was to bring about homogeneity and greater solidarity so that people could participate in the planned development of the resources of the country and all those bottlenecks which came because of differences of understanding were done away with.

This type of re-organization is to bring about a greater speed in the movement towards economic well-being. The organization of communes in China can also be taken in some such light. It is to integrate the people in the economic development of the country and make them participate in it fully and heartily.

Frequency of Political Changes and Their Effect—Too frequent changes in the political condition of a country tend to bring about instability and, as such, they are bad for the economic development of a region. Mexico in North America has very rich natural resources but it has not been able to exploit them fully and develop to its highest point only because the Government there is weak and instable and more often than not, there are political upheavals resulting in looting and rioting. Other countries of South America have also not been able to develop because of this very defect. Peru, Brazil and Argentina along with Colombia and Venezuela are a few such examples. In these regions, there is lack of national solidarity; internal dissensions and strifes are rampant. The people of one province call the people of the other not only bad but also savage, uncivilized and barbarian. There are frequent changes in Government and the political administration is weak. Revolts and coupe d'etat are the normal

rule. The life and property of the people is unsafe, and people do not feel any sense of security. Even the foreign investors hesitate to invest capital in these regions. The result is that they continue to be economically weak and poor.

13. ADVANCED KNOWLEDGE OF SCIENCE & TECHNOLOGY

Relief and climate are the most important forces of nature. They always exist in their positions. Mountains will remain where they are and the tropics will always be tropics. But man has been successful in turning these forces to his own advantage or at least in considerably modifying their effect.

Relief and Human Control

Relief plays an important part in determining the economic activities of man. We know how steep slopes and run-off situation on mountains hinder agriculture in these areas. Besides this, hard rocks of mountains weather into thin poor soils which support shallow rooted poor grasses or very poor plants. Plateaus, too, have hard rocks, and therefore, present the same difficult situation for agriculture. In contrast to it plains and valleys have deep soils which are generally fertile and support good crops. These areas are, therefore, very suitable for agriculture.

Relief features hinder economic activities in two ways. Firstly they hinder or help agricultural activities through the development of soils on their surface. We all know that through the agencies of decay and disintegration the rocks of earth's surface weather into soils of various types. Soil is an important factor in the production of vegetation because it supplies plant food. Secondly, relief features hinder agricultural activities by denying level land for this purpose. Man has tried to modify these adverse effect in the following ways :—

(a) **The use of Fertilizers**—By research, man has been able to find out the chemical composition of foods that different plants take from the soil. These plant foods are added to the soil in order to increase its fertility or capacity to give up foods to the plants very readily. These fertilizers or plant foods are supplied to the soil in a number of ways. Animal refuse may be added to the soil or some legumious crop may be grown and then ploughed in the field while it is green or some chemical manures may be added. Chemical manures supply lime, phosphates, potash and nitrates in the forms in which plants can readily assimilate it. The use of fertilizers has become a very important feature of agriculture in areas of dense population, because it is necessary that the maximum production must be obtained from the land.

(b) **Terrace Cultivation**—In south-east Asia, valleys and plains do not produce enough food to feed millions of hungry people. In Japan and Java the plain area is very much limited and the population is very large which means that the demand of foodstuffs is enormous. In such countries terracing is adopted to

increase the area under cultivation. This system involves the cutting of terraces in the hill slopes. Each terrace is kept level by a wall of stones which sweeps round the whole hillside. Consequently each terrace is very long but only a yard or so wide. Just above each terrace another terrace is cut and thus the terraced hillside looks from a distance like gigantic flights of steps in some cases to the very top of the mountains. Water supplied from above slowly passes from one terrace to the next one watering each step-like long field. In Japan, China, Java, Indo-China and Ceylon such fields are common features of the landscape in hilly areas. By this method cultivation of crops is carried on to a height of several thousand feet above sea level.

Climate and Human Control.

Climate controls more or less all forms of agriculture. Heat determines the growth of vegetation and the amount of moisture determines the utilization of plant foods present in the soil. We cannot grow rubber or cotton in England. But man can get larger harvests and better crops by introducing artificial means of making the best possible use of natural conditions. Let us consider some of the more important ways of utilising the natural conditions.

(a) **Irrigation**—In many parts of the world there is a long dry season. Farmers in such dry lands use water from distant rivers or from great reservoirs which have been built at huge expenses by damming the courses of rivers, and by leading its water into canals for irrigation. In some parts of India rainfall is precarious and is confined to one season only, while the temperatures are suitable for crop production all the year long. In such parts millions of people live simply because they can grow crops on irrigated lands. In Victoria State of Australia large fruit gardens get their requirement of water from reservoirs built on distant hills.

(b) **Dry Farming**—In some parts of the world rainfall is not plentiful. Western Canada, Australia and similar other regions have less than 20 inches of rainfall a year. In other areas as in the basin of the Columbia river, U.S.A., rain falls chiefly in winter instead of in summer when it is not wanted for growing crops. In these areas farmers go in for "dry farming". The purpose of this type of farming is the same as is that of irrigation, but in a different way. Farmers want to prevent moisture in the soil from being lost by porosity of soil or by evaporation. This is done by deep ploughing so that water may sink in deeper. As soon as one harvest is done, farmers plough their fields. In western Canada snow falls in winter. This snow does not drift away but soaks in the ploughed land. The moisture in the soil is protected from the rays of the hot sun just underneath the stony surface. Stones protect the soil and help to keep moisture in it. If the fields are not stony, moisture is protected by maintenance of a layer of dust or dust much over the surface of fields. In order to prevent the

growth of weeds, which would use up moisture in the soil, frequent hoeing or shallow ploughing is practised. Repeated tilling keeps the surface stirred and checks the growth of weeds. The conserved moisture is economically used by such valuable crops as wheat, cotton, oats, barley and beans etc. Thus conservation of moisture and its economic utilization become essential features of dry farming.

(c) **Drainage**—In some lower part of the world rainfall is very heavy. Near the equator hot wet conditions produce very luxuriant forests but in temperate areas land becomes swampy or even water covered. In these areas surplus water is drained and the land is made productive for crops.

(i) In the fens of eastern England surplus water has been drained while in Holland the polders have been reclaimed even from the sea (Zuider Zee) and the reclaimed land has become important farming area.

(ii) In Malaya, Ceylon, and Indonesia farmers have cut down or burnt trees, drained the surplus water, tilled the soil and planted it with rubber, tea, cocoa and other products. This is called plantation agriculture. The area of plantation agriculture is increasing day by day. Even in Amazon and Congo basins people have carved out plantations.

Modern Advances in Technology and Housing—In recent years, however, with the advancement of science and technology, with the growth of better means of transport and a greater engineering aptitude, more and more buildings are being constructed on modern lines and there is a tendency to make the houses without caring for the needs of environment or the locally available building materials.

CHAPTER II

World Population : Distribution And Growth

Any map of world population distribution will show that man lives in very unevenly distributed areas across the face of the earth. And those areas where he is most rarely found are, in almost every case, areas where the physical environment is, by his definition of the term, hostile. The best examples are deserts, icecaps, very high and rugged mountains, and regions where the soil has been removed by erosion. This fact is of significance to the economic geographer in two ways. First to a greater extent than we may wish to admit, what man does in any given place is a matter of his choice among alternatives proposed to him by the environment. These alternatives, in turn, reflect the operation of the Law of Limits. Second, resources in and of themselves do not create economic activity. For all we know, there may be vast quantities of coal under the Antarctic ice. So long as climate and the presence of the ice limit man's ability to live and survive in Antarctic, the coal might just as well not be there.

1. DENSITY PATTERN

However, Europe is still the most densely populated continent, with an average of 90 persons per square kilometre compared with the world average of 24, East Asia is not very far behind, with an average of 72 per square kilometre. The pattern of population density will become clear from the following four tables.

Table II : 1 Some Countries of Extreme Low Density

<i>Countries</i>	<i>Area</i>	<i>Population Mid-Year 1965 (in 000)</i>	<i>Density Per Square Km.</i>
Algeria	2,383	11,871	5
Libya	1,780	1,617	1
Somalia	638	2,500	4
Zambia	746	3,710	5
Canada	9,976	19,604	2
Greenland	2,176	40	0

Bolivia	1,099	3,697	3
Paraguay	407	2,030	5
Saudi Arabia	2,253	6,750	3
Iceland	103	192	2
Australia	7,695	11,360	1
U.S.S.R. (Asia)	16,831	54,695	3
South-West Africa	825	574	1

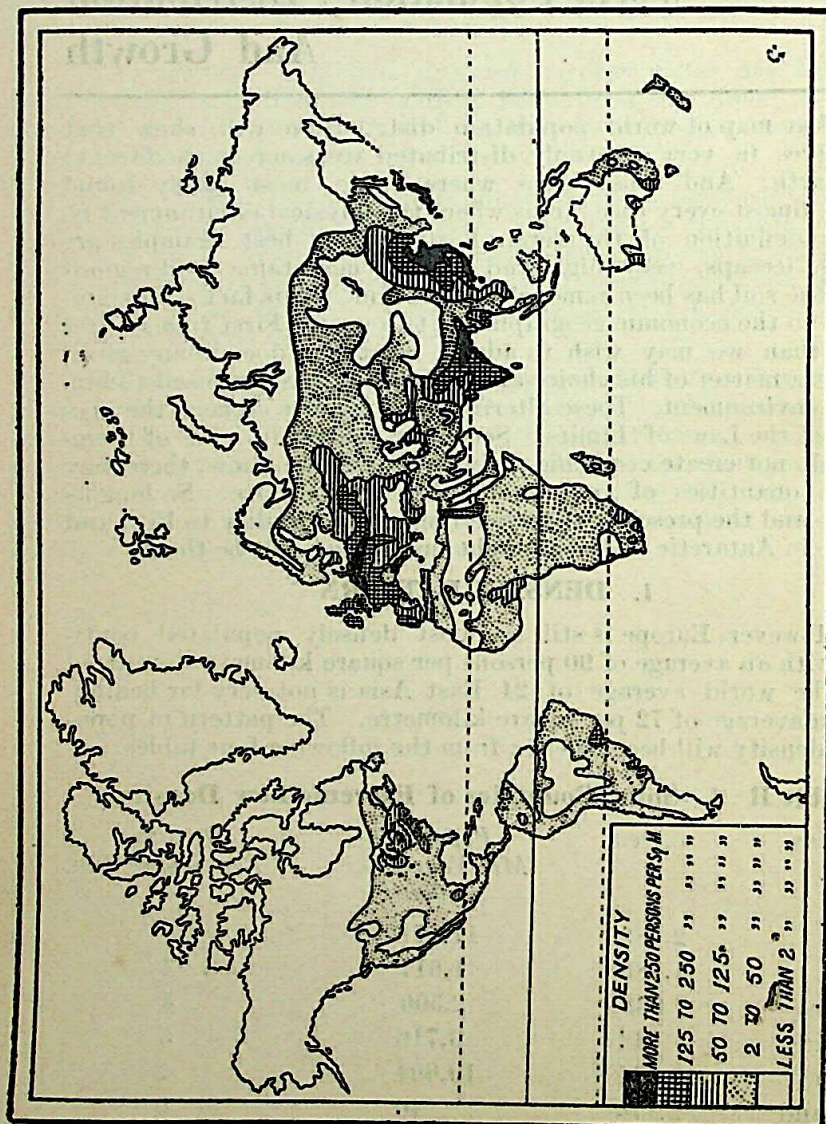


Fig. 2. Density of Population in the World.

Table II : 2 Density of Population in Some Regions

<i>Regions</i>	<i>Population (in Million)</i>	<i>Area (in '000 Km.)</i>	<i>Density (Per Sq. Km.)</i>
Middle Africa	30	6,607	6
Western Africa	93	6,159	15
South-East Asia	236	4,498	52
Western Europe	140	987	142
Northern Europe	78	1,636	48
U.S.S.R.	230	22,402	10
South-West Asia	63	4,616	14
WORLD	3,260	135,761	23

Table II : 3 Some Industrial Countries with High Density of Population

<i>Country</i>	<i>Population (in Million)</i>	<i>Area (in '000 Km)</i>	<i>Density (Per Sq. Km.)</i>
U.K.	55	244	224
West Germany	57	247	229
Belgium	94	30	310
Japan	98	370	265

Table II : 4 Some Countries of high Density with Low Level of Economic Development

<i>Country</i>	<i>Population (in Million)</i>	<i>Area (in '000 Km.)</i>	<i>Density (Per Sq. Km.)</i>
India	483	3,064	159
Ceylon	11	66	171
Indonesia	105	1,491	70
Pakistan	102	947	109
Ecuador	5	271	18
Ethiopia	22	1,184	20
Sudan	14	2,505	5

2. TRENDS AND FEATURES OF WORLD POPULATION EXPLOSION

The world's population which is just over 3.6 billions at present will double itself in about 35 years time, that is, by 2005 A. D.

The population is currently increasing at the rate of 1.82 lakh persons per day or 70 millions per year. The increase is due

to a steady high birth rate and a decrease in mortality caused by advances in hygiene and medicine.

The birth rates are about 40 per 1000 in developing countries and 20 per 1000 in developed regions. The death rate for developing regions is 16 per 1000 compared to 9 per 1000 in advanced countries.

The present annual increase of two per cent is the highest recorded in human history, births outnumbering deaths in the ratio of 2:1.

Dimensions of the Increase—The dimensions of the increase will be evident from the fact that it took mankind all of recorded time until 1850 for the world population to reach one billion. It took another 80 years to add the second billion and only 30 years for the third billion. The fourth billion will be added in less than 15 year's time. At the present rate of increase, the population will reach 7 billion by the end of the century. After 2005, A.D. additional billions will be added in 7, 6 and 5 years to reach 10 billion by 2020 A.D. Most of these increases (about 58 millions a year) occur among the poorer (developing) countries in Asia, Africa and Latin America.

These countries have 1/8 of the world's income but have to support 2/3 of the world's population. Forty-two per cent of the population in these areas is below 15 years of age (compared to 25 per cent in the more developed countries). This would mean that a large number of persons would soon reach the reproductive age group and that any birth control programme to be successful would have to cover a very vast group of people.

Trends in Asia—The continent of Asia with 15 per cent of the world's land area has 55 per cent of the world's population. Its present population of 2 billions is increasing at the annual rate of 2 per cent despite active family planning movements in most of its constituent countries. *Mainland China* is the most populous nation in the world with about 750 million people (1/5 of world's population). Since 1957, China has launched comprehensive birth control campaign and as a result brought down the birth rate. The recent indications are that the annual increase has decreased from 2.2 per cent to 1.4 per cent.

India's present population of 540 millions is likely to reach about 555 millions by 1971 which means an increase of about 11.5 millions over the 1961 census figures. the highest population reached during the two census. Since 1966, the Government of India has launched a vigorous family planning drive and during the last 3 years over 4 million sterilisations have been done. However, during the current year, the results are not very satisfactory and hopes of reducing the birth rate of 40 per 1000 to 25 by about 1975 is not likely to materialise.

Japan has drastically cut down its birth rate since 1948 by an effective population control movement particularly by liberalising the abortion laws and the dissemination of knowledge and use of contraceptives. Japan which had a birth rate of 36 per 1000 in 1948, has brought it down to 17 per 1000. It has the lowest

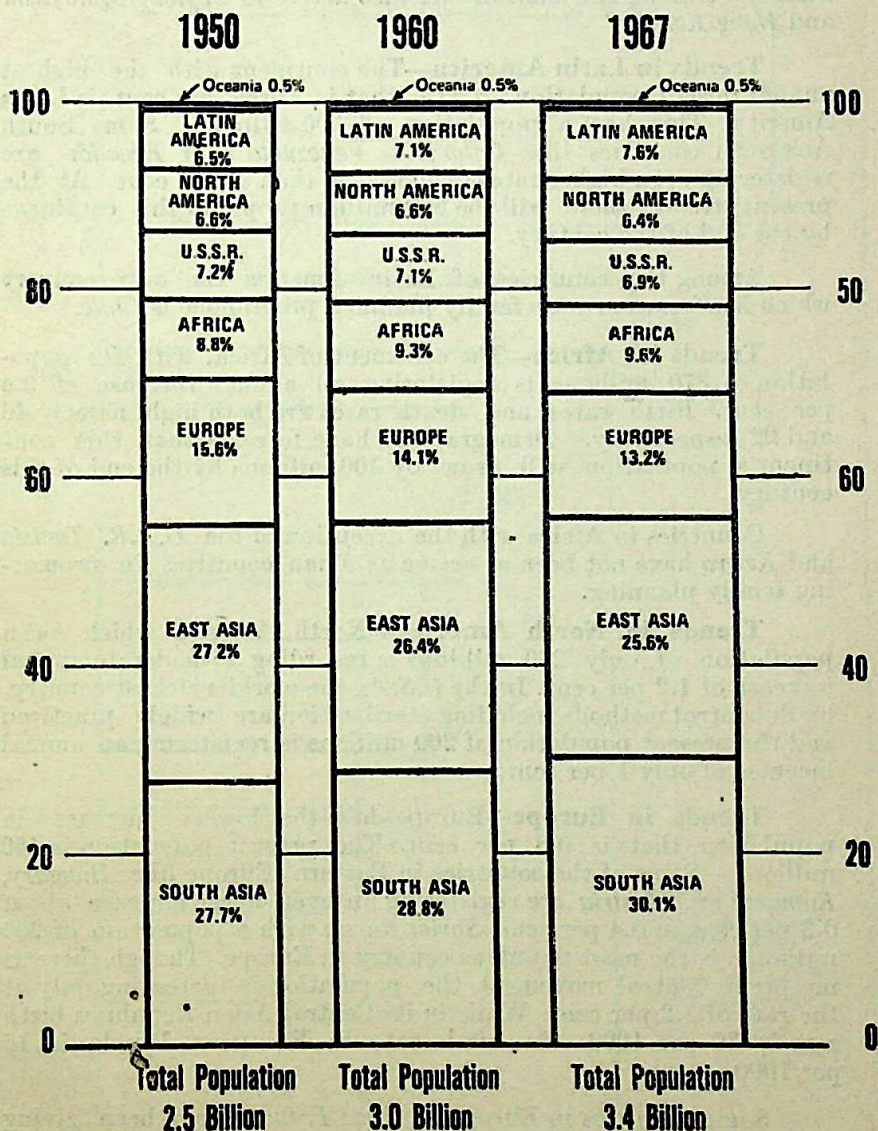


Fig. 3. World Population by Major Areas and Regions.

annual rate of growth in Asia—one per cent—the same as the U.S.A. The Japanese have uniformly accepted the norm of a small family and are averse to having more than two children on economic considerations.

Pakistan, which has a population of about 120 millions, has also a Government-sponsored effective family planning campaign. Family Planning Associations are also active in *Ceylon*, *Malayasia* and *Hong Kong*.

Trends in Latin America—The continent with the highest annual rate of population growth, that is, three per cent, is Latin America. This has a population of 300 millions. Some South American countries like *Colombia*, *Venezuela* and *Ecuador* are registering even higher rates of increase than 3 per cent. At the present trend, there will be 800 million people in this continent by the end of the century.

Among the countries of Latin America the only country which has a nation-wide family planning programme is *Chile*.

Trends in Africa—The continent of Africa, with its population of 370 millions, is registering an annual increase of 3.0 per cent. Birth rates and death rates are both high, namely 46 and 22 respectively. Demographers have forecast that this continent's population will grow by 400 millions by the end of this century.

Countries in Africa with the exception of the *U.A.R.* *Tunisia* and *Kenya* have not been as active as Asian countries in promoting family planning.

Trends in North America—North America which has a population of only 230 millions is recording a moderate annual increase of 1.2 per cent. In the *U.S.A.*, the world's richest country, birth control methods including sterilisation are widely practiced and the present population of 200 millions is registering an annual increase of only 1 per cent.

Trends in Europe—Europe has the lowest increase in population that is 0.8 per cent. The present population is 450 millions. Some of the countries in Eastern Europe like *Hungary*, *Rumania* and *Austria* are registering an even lower increase about 0.3 per cent to 0.4 per cent. *Soviet Russia* with a population of 200 millions, is the most populous country in Europe. Though there is no birth control movement, the population is increasing only at the rate of 1.2 per cent. While in its Central Asian Republics birth rate is 36 per 1000, the birth rate in European Russia is 15 per 1000.

Some countries in Europe, such as *France*, have been giving incentives for large families but people are not in favour of large families as they consider them a burden on their resources.

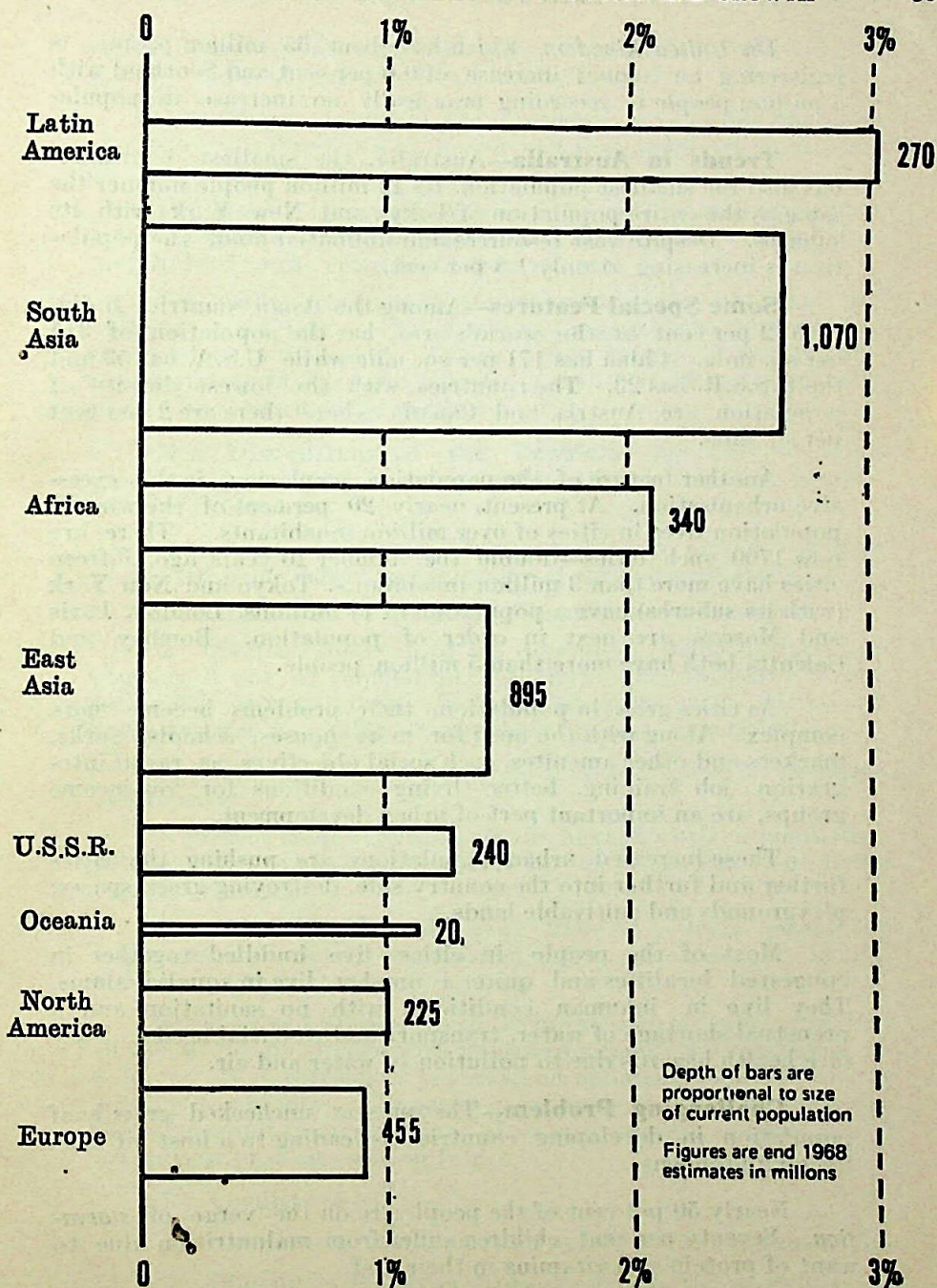


Fig. 4. Growth in World Population
Percent increase end 1967—end 1968

The United Kingdom, which has about 55 million people, is registering an annual increase of 0.6 per cent and Scotland with 5 million people is recording practically no increase in population.

Trends in Australia—Australia, the smallest continent, has also the smallest population. Its 11 million people number the same as the entire population of Tokyo and New York with its suburbs. Despite vast resources and unlimited land, the population is increasing at only 1.8 per cent.

Some Special Features—Among the Asian countries India, with 2 per cent of the world's area, has the population of 315 per sq. mile. China has 171 per sq. mile while U.S.A. has 53 and the U.S.S.R. has 23. The countries with the lowest density of population are Austria and Canada where there are 2 per cent per sq. mile.

Another feature of the population 'explosion' is the excessive urbanisation. At present, nearly 20 per cent of the world's population lives in cities of over million inhabitants. There are now 1700 such cities—double the number 10 years ago. Fifteen cities have more than 3 million inhabitants. Tokyo and New York (with its suburbs) have a population of 11 millions. London, Paris and Moscow are next in order of population. Bombay and Calcutta both have more than 5 million people.

As cities grow in population, their problems become more complex. Along with the need for more houses, schools, parks, markets and other amenities, such social objectives as racial integration, job training, better living conditions for low-income groups, are an important part of urban development.

These increased urban populations are pushing the cities further and further into the country side, destroying green spaces, playgrounds and cultivable lands.

Most of the people in cities live huddled together in congested localities and quite a number live in squalid slums. They live in inhuman conditions, with no sanitation and a perpetual shortage of water, transport and essential needs. They face health hazards due to pollution of water and air.

Challenging Problem—The present unchecked growth of population in developing countries is leading to a host of challenging problems.

Nearly 50 per cent of the people are on the verge of *starvation*. Seventy per cent children suffer from malnutrition due to want of protein and vitamins in their diet.

Large scale *unemployment* is also threatening developing countries with unrest and social tensions. A large number of

young people are moving to the urban areas to find work, only to join the ranks of unemployed or semi-employed.

According to scientists, the 'optimum population' the earth can support is 6 to 8 billion people and that figure will be reached by the year 2000 A.D.

The rapidly rising tide of population is undermining virtually all efforts to raise the *living standards* of people and will ultimately lead to the erosion of *human values*.

The quality society with quality existence is now unattainable in many parts of the world and may soon be unattainable in any place in the world. The economic struggle of over-population is the world's greatest threat to quality living and eventually to man's existence on the earth.

New Dimensions of the Problem—Increases or rapid growth of population in underdeveloped areas becomes complicated in three ways :—

1. Increases pressure of population on already densely populated land ; affects productivity of agricultural labour.
2. Aggravates the problem of capital resources shortages.
3. Creates a heavy load of dependent children upon the working sector of population. Children upto 15 years of age form 40% or more of the total population in Asia, Africa and Latin America ; and 20% or nearabouts in European Countries.
4. Larger families are unable to save and invest for economic development.

If present trends continue, in the next 25 years, a population will be added to the world equal to all the people who were living just 100 years ago.

Since the end of World War II there have been substantial improvements in food consumption, health, education and income but housing has not improved much.

Rapid urbanisation, especially in the underdeveloped regions of the world unmatched with improved agricultural activities, results merely in transfer of poverty and underemployment from the country to the city. The social gains made possible by industrialization result in an overflow of moral distress conditions. It brings new problems arising from :

1. Conflicts of culture.
2. Interactions of old and new customs and patterns of life.
3. Difficulties in personal adjustments to the reorganization of social structure.
4. Increase in juvenile delinquency.

3. FOOD-POPULATION DILEMMA AND ECONOMIC DEVELOPMENT

About half of the world population was currently underfed or badly fed, and an estimated 3,000,000 people died every year from malnutrition.

Though there was no food problem in North America and Europe, the problem became daily more acute in underdeveloped regions of Asia, Africa and Latin America.

The problem was made worse by the enormous fertility potential in these areas where those under the age of 15 made up over 40 per cent of the population.

All the same, total food supplies would have to be increased fivefold on the developing nations by the end of the century.

With population in underdeveloped areas increasing at the rate of 3 per cent annually, an equivalent yearly rise in food production was needed. "But from 1958 to 1965, the average rate of growth has been about 2 per cent. Last year, the situation was even less satisfactory—total world food production did not rise at all."

The solution seems to be in two broad lines of action: increased farm production in developing countries and population stabilization by birth control.

The British economist Colin Clerk has asserted that by making the most of science and technology, it would be possible to produce enough aminoacids to sustain 45,000 million people. This figure is challenged by another authority, however, for a world population of such dimensions would throw unbearable strains of a different nature on our resources. Not only would it be necessary to cultivate every inch of available land but also further space would have to be found, in itself agriculturally unproductive, for new towns, new roads, all the other bits and pieces needed on account of man not living "by bread alone". It must not be forgotten, however, that there are many countries today which cannot develop their agriculture efficiently because of low population density. It is not always the most densely-populated countries which have nutrition difficulties.

The equation linking overpopulation and hunger can only be understood if a number of other essential factors are taken into account. These factors include the level of economic development, education, climate, and the quality of the soil. There are also some highly industrialised countries which rely largely on food produced elsewhere. But a developing country which has to make huge purchases of wheat or other foods abroad in order to meet the needs of her people, inevitably weakens her foreign exchange position thereby putting a brake on her own industrial and agricultural development and puts off the day when he will be independent of foreign economic aid. The food situation in

many countries is also worsened by religious taboos, by lack of nutrition, education and by vast though preventable wastage (rats for example).

**Per Cent Increase In
Caloric Requirements
1965-1985**

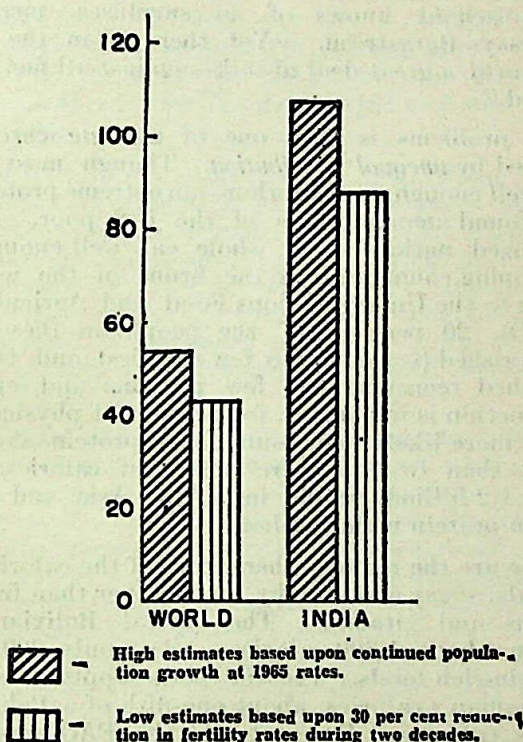


Fig. 5

Real Dimensions of the Problem—The last two or three years have witnessed, largely from the West, an outpouring of hope and hopefully construed statistics about the food-population dilemma. This euphoria over an imminent "green revolution" is largely technological: new "miracle" strains of rice and wheat have doubled or tripled yields under carefully controlled conditions; the food chain has been abbreviated at critical points so that proteins can be derived directly from algae or bacteria. Nevertheless, it is sobering to consider the true magnitude of the crisis. Since World War II the world's fisheries and farms have made enormous, unprecedented gains. Yet in this same period, population growth has clearly outpaced the harvests. The human race is growing by over 70 million people a year, and the rate of increase is itself increasing in many developing areas. Despite

its marriage in many areas to the most vaunted technology the world has known, food production has not kept up. The numbers of malnourished (along with the numbers of illiterate) are increasing daily.

Today, if all the food in the world were equally distributed, everybody would suffer from malnutrition. "The world as a global household knows of no surpluses, merely enormous deficits," says Borgstrom. "Yet there is in the well-fed part of the world a great deal of talk—against all facts—of an abundant world."

The problem is thus one of *absolute scarcity*, but it is exacerbated by *unequal distribution*. Though most North Americans eat well enough, kwashiorkor—an extreme protein deficiency—has been found among groups of the U.S. poor. And while the industrialized nations as a whole eat well enough or too well, the developing countries bear the brunt of the world's hunger. According to the United Nations Food and Agriculture Organization (FAO), 20 per cent of the people in these countries are under-nourished (consume too few calories) and 60 per cent are malnourished (consume too few proteins and other nutrients). This distinction is important, for permanent physical and mental damage is more likely to result from protein shortage in early childhood than from a mere deficit of calories. In absolute numbers, 1.2 billion people in Africa, Asia and Latin America suffer from protein malnutrition.

These are the regions where most of the calorie intake comes from cereals, sugar and starchy roots rather than from foods rich in proteins and vitamins. The typical Bolivian manages to survive on about 1,800 calories a day, only 200 of which come from protein-rich foods. Protein foods supply less than a third of an Ethiopian's calories, about one-fifth of a Pakistani's or an Egyptian's calories. By contrast, the FAO has set a world "target" of 2,400 calories per person daily, at least one-third of which are to be supplied by foods rich in protein and nutrients other than starches, cereals and sugars. This modest goal is still well beyond the reach of most countries. Further more, in Africa and other developing areas, the protein deficit is complemented by shortages of fats, minerals and vitamins, which are severe among all age groups. The resulting goitre, beriberi, xerophthalmia and arinoflavinosis take an enormous toll. In India, an estimated 60 per cent of the women are suffering from chronic anaemia.

The Vicious Circle—There is a clear link between malnutrition, demographic increase and family size in the developing world. In large families early weaning is a necessity, and each child must then compete with many others for its food. Large family size, in turn, reflects the high death rates associated with economic development.

The developing regions already have well over 2,000 million people with an annual increase of about 58 million people. According to U.N. "median" estimates, their populations will soar by century end to 768 millions (Africa), 638 millions (Latin America) and 3,500 millions (Asia). No man can predict with any assurance that all these people will be adequately fed.

Meanwhile, the rapid demographic growth of the developing countries (from two to over three per cent a year) has heavily weighted their populations towards the younger ages. While only 25 per cent of all Europeans are under 15, the corresponding figure for Africa is 43 per cent, for Asia 40 per cent and for Latin America 43 per cent.

A substantial majority of people in Asia, Africa and Latin America are farmers; but, ironically, food shortages are chronic. Most are subsistence farmers who produce little for urban markets; thus, the production of capital by the agricultural sector is minimal, and there is little income in rural areas to buy the goods of the cities. This, of course, is a classical model of "underdevelopment" (a misnomer since the soils, forests and waters of most of these countries are, if anything, overdeveloped), but it has some ironic effects.

Irony of Food-Aid Policy—Compounding this irony is the food-aid policy of the industrialized nations, which are now shipping about three million tons of grain protein annually to the developing areas. At the same time the developing nations are attempting to amass foreign exchange through the export of cash crops. Very often this effort, which is disproportionately favoured by credit, irrigation and fertilizers, has taken the best land out of normal food production and this, in exchange for three million tons of higher-grade protein in the form of oilseed, fishmeal, soyabeans, groundnuts and the like Borgstrom, asks "Is it reasonable that tropical Africa, so critically short both of fat and protein, is parting with a quantity of protein in the form of groundnuts to feed the dairy cattle and poultry of western Europe and to bolster the fat intake of Europeans?"

Erosion of Human Resources—Poor diets and Malnutrition not only cause enormous suffering, they also erode the human resources needed for economic development.

1. It wastes manpower through premature death. Life expectancy at birth in North America and Europe is a little over 70 years; in Latin America it is 60, in Asia 50, and in Africa 43. According to nutrition expert Alan D. Berg: "Where malnutrition reduces life expectancy, the cost to society for education and other supporting expenses through the pre-productive years becomes proportionately greater per year of productive output".

2. Malnutrition reduces physical productivity. It has long been established that malnutrition permanently stunts

physical growth, and that in many developing countries the average 12-year-old has the stature of an eight-year-old in Europe. The effect of stunted growth on a worker's peak productivity is obvious: his musclepower is simply in short supply, but at a subtler level, malnutrition undermines even the will to work.

3. Malnutrition lowers resistance to disease and increases absenteeism.

4. The medical costs for treating malnutrition are probably greater than the costs of providing the necessary nutrients to begin with. Bergeites an estimate that "the cost of 90 days of hospitalization for each case arising from inadequate nutrition (in Guatemala) is \$ 600, compared to an annual cost of \$ 7 to \$ 10 to prevent the malnutrition".

5. Malnutrition retards mental development, in some cases irreversibly. Of all the human tragedies responsible for low productivity, this is probably the most enormous, most severe, most self-perpetuating.

Measures Necessary for Combating This Situation—The world needs an unprecedented effort by all the industrialized nations to co-operate in a prolonged campaign of food production aid to the developing countries. This aid would involve more intensive research and training programmes than have hereto-fore been forthcoming, many more technological and biological studies, a far greater export of technicians to help develop more food projects, equitable trade policies and money to implement these activities.

It should be accompanied by a drastically intensified effort by the developing countries themselves to raise their food output for domestic consumption, and to devote to this goal the calibre of trained manpower and material resources which is not applied to cash crops. These countries also face a gigantic task in public education, for the ignorance of proper diets is causing malnutrition even where good food is available to the population.

And finally there should be a co-operative effort by the industrialized and developing nations—with the latter controlling the programmes to make birth control effective. In the words of F.A.O. Director-General A.H.Boerma: "Continued uncontrolled population expansion could, however, still cause these hopes for adequate food to be dashed. It is necessary, therefore, to redouble efforts to slow down the growth of population".

Education has a very important part to play. Too often we find malnutrition, even hunger, in regions where in theory food should not be scarce. When, for some local reason, there is a ban on eating eggs or fish or certain kinds of meats, people often substitute things which are low in vitamins, iron and amino-acids, and therefore are not sufficiently nutritious. Very often these

dietary deficiencies aggravate the condition of the persons already weakened by parasitic disease, such as biharziasis and ancylostomiasis.

Fortunately, modern science is potentially capable of meeting the challenge of a population of 6,000 millions or 7,000 millions by the year 2,000. But to do so, total world food production would have to be increased by 170 per cent, and that of the products of animal origin by 200 per cent. The production increase required in the developing countries where nutritional deficiencies are most frequent, would have to be of the order of 500 per cent. (i.e. six times the present output).

There would also have to be a radical adjustment (will it ever be achieved ?) of world trade sweeping away the present division between "rich" and "poor" countries. We could take another step in the right direction if consumers could be persuaded to change their food habits to some degree. Government could make an important contribution by subsidising certain food products which are rich in protein. Groundnuts, oilseed and even some industrial residues now used in their raw state as cattle fodder could be specially treated for human consumption.

But it is not enough simply to find more food. Man also needs shelter, education, welfare and a social life. He needs not only the means, but also a reason to live. All this may still be within the bounds of achievement in a world of 7000 million people, as predicted for the year 2000. But all our hopes would be submerged if the present geometric rate of progression were to continue; some 40 years later there would be a population of 12000 millions. Children now being born may well live to see the year 2040.

Conclusion—The malnutrition—development crisis is a vicious spiral. Under-development means low incomes, relatively poor health, a high birth rate, infant mortality, poor diets and malnutrition. Malnutrition, on the other hand, saps the vigour and creativity of the human resources which are indispensable to development. This is a vicious spiral, not just a circle, because the human tragedy grows with each generation: there are, in absolute terms, more underfed people now than there were a year or even 20 years ago.

4. POPULATION *Vis-a-Vis* ECONOMIC PROGRESS

Population is a very important economic resource and scarcity of population is as great a hindrance to economic development as over-population. Although man is adaptable and can live anywhere in the world with the exception of Polar regions and the summits of the highest mountains, there are obvious limitations because of climate. Extremes of cold or of heat, accompanied by low rainfall badly distributed throughout the year gives rise both to floods and soil erosion. The chief geographical factors responsible for the growth of population are (a) agreeable climate

for settlement (b) availability of suitable land for cultivation, (c) presence of natural resources as basis for economic activities and (d) favourable location or accessibility to markets. These factors operate jointly although one or two of them may be more important at a certain stage.

Cold and hot deserts, mountains, prevalence of disease and unhealthy climate are the limiting factors from the side of physical environment.

There are countries in Asia, Africa and South America where, in spite of their large size present population is more than what they can bear. It is not a problem of over-population as such because density is still low compared to other countries, but of under-production.

Population and Land—The U.S. Navy Hydrographic Office in Washington gives the area of the earth as approximately 197 million square miles. Of this, approximately 140 million square miles are ocean and another 5 million are desert. Thus, we can in effect write off almost three-fourths of the earth's surface as economically unproductive, even at the very lowest level of productivity. This leaves some 52 million square miles to feed clothe, and shelter the three billion of us who depend upon it for a living. That works out to a density of roughly sixty people per square mile of productive land—most of which is, at present, only marginally productive for such uses as hunting, fishing, forestry, and nomadic herding. A population density of sixty to the square mile is comparable to that of Alabama or Louisiana. The real significance derives, however, from the very unequal distribution of population over the face of the earth—a distribution pattern which is not closely related to the distribution of fertile soil and other resources.

It is estimated that, with the present world population of about 3,000 million people, there are 12.5 acres of land available as living space for each man, woman and child. Only 1.1 acres of this "living space" is actually cultivated, while 2.65 additional acres are potentially cultivable. The soil is inadequate on 1.25 acres, 2.5 acres are too arid, 2.5 acres are too mountainous for cultivation and 2.5 acres have too cold a climate to grow any crops at all. The map on page 49, taken from Professor Dudley Stamp's book *Our Developing World*, shows in black those parts of the earth's surface which are unfavourable to agricultural development. It does not take account of irrigation settlements where "the negative character of the land has been counteracted, notable in Egypt, Iraq, Northwest India, West Pakistan, U.S.S.R., Central Asia, and parts of the Western United States." Such irrigation projects are very costly and governments cannot easily afford to undertake them. The blank areas on the map are potentially cultivable or are actually cultivated.

Population and Farm Supply—An outstanding feature of the world food situation is that the regions most in need of

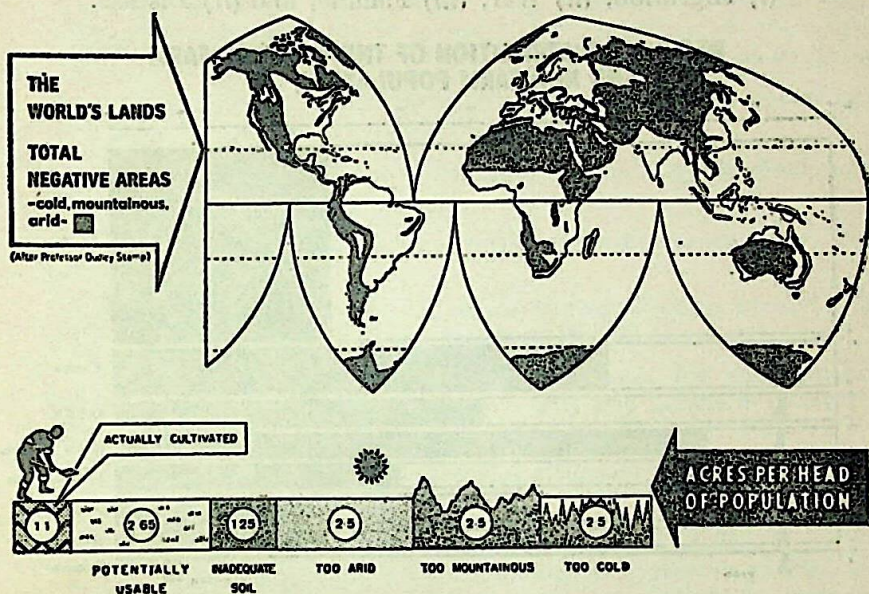


Fig. 6

increased food production and consumption have the largest percentage of the population engaged in agriculture. In countries where the standard of living is high, such as in Western Europe, the United Kingdom, North America and Oceania, the percentage of the working population engaged in agriculture is between about 35 per cent and 5 per cent whereas in many of the countries of Asia and Africa 80 per cent or more of the population works on the land. For example, the United Kingdom has only 5 per cent engaged in agriculture, but Thailand has 85 per cent.

There are, of course, many factors which contribute to this situation—the size of farms ; mechanization ; the use of fertilizers, insecticides, and pesticides ; and the widespread use of modern improved agricultural practices, etc.— all of which make possible a very high production per man. On the other hand, in many of the underdeveloped countries the size of holdings is small, land tenure systems do not encourage increased production, the use of fertilizers, pesticides and insecticides is negligible, and the production per man is little more than that required for his own subsistence. It has been estimated, for example, that the production of the average African farm family feeds less than one non-farm family besides providing for its own needs. In the developed agricultural countries the average farm family produces enough to feed itself as well as some 10 to 20 non-farm families.

Population, however, adjusts itself to limited food supplies through :

(i) Migration; (ii) War; (iii) Famine; and (iv) Disease.

REGIONAL DISTRIBUTION OF THE WORLD'S FARM AND NON-FARM POPULATION, .

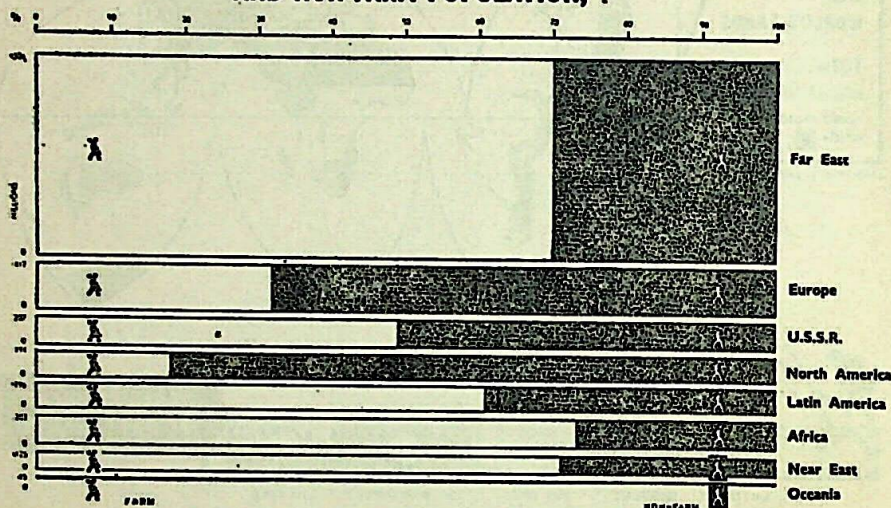


Fig. 7

Available Farmland

$$\frac{\text{Earth}}{\text{Population}} = 60 \text{ acres per person}$$

$\frac{3}{4}$ is covered with water ; so 15 acres per person. The really productive areas of the earth actually amount to 0.2 acre for each mouth to be fed. Only about 7% of the Earth's Land has the environmental factors satisfactory for the production of food viz.,

(i) Adequate sunlight; (ii) Favourable temperature; (iii) Favourable topography; (iv) Adequate and reliable rainfall; and (v) Fertile soil and there are only 3 such areas :

1. Southeastern Asia.
2. Central North America.
3. Western Europe (North of Alps).

Europe	Vs.	North America
Size $\frac{1}{2}$	:	1
Land for Food Production 1	:	$\frac{1}{2}$
Yield per acre, care of soil and No. of people supported per acre I	:	II
Production per man II	:	I

Barriers which restrict attempts to greatly expand food supplies in the world are :

Cultural Barriers—(i) Man lacks animal protein in their diet while cattle continue to consume the vegetation of the earth at the expense of the human inhabitants of that nation as in India.

(ii) Expanding human population on earth without concurrent expansion in the ability to produce food.

Technological Barriers—Our apparent inability to yield more good food for people to eat.

(a) Less than 10% of the earth's land space is used for food production.

(b) About $1/10$ to $\frac{1}{2}$ of 1% of the sun's radiation received at the earth's surface is fixed as organic material.

(c) Taking the earth's surface as a whole, for each million calories of energy reared from the sun only one calorie is converted into human food.

(d) About $\frac{1}{2}$ of the food material ultimately produced reaches the human stomachs of the world.

Methods so far adopted—1. International trade.

2. Improved productivity—amount of materials yielded per acre instead of pounds of crop per acre. (a) Selecting crops or animals that mature in a shorter growing season (b) Plants for human consumption rather than for live stock feed.

3. Reducing losses during production, storage.

4. Improved distribution and utilization by advances in food preservation methods.

5. Increasing the yield of soil.

6. Developing new production areas.

5. PRINCIPLE OF GEONOMIC SUCCESSION

The choice of industry in any given place depends not only upon the physical limits and available technology, but also upon the size of the population, as Renner puts it.

As population increases, any human society tends to shift its geonomic dependence from one set of environmental elements towards a more productive set of elements. Conversely, where population decreases, human society tends to shift its geonomic dependence to a less productive set of elements.

This principle can be observed in operation, either historically or as a contemporary phenomenon, in any part of the world where there have been significant increases or decreases in human population. Thus, in several islands of the Caribbean area.

where sugar plantations were one of the earliest uses of the land, steadily mounting population eventually forced the commercial sugar economy out of the picture and replaced it by an intensive subsistence economy. In Ireland, on the other hand, and in some of the hill districts of Southeast India, emigration has resulted in the return of agricultural land to economically less productive uses such as grazing land and forest.

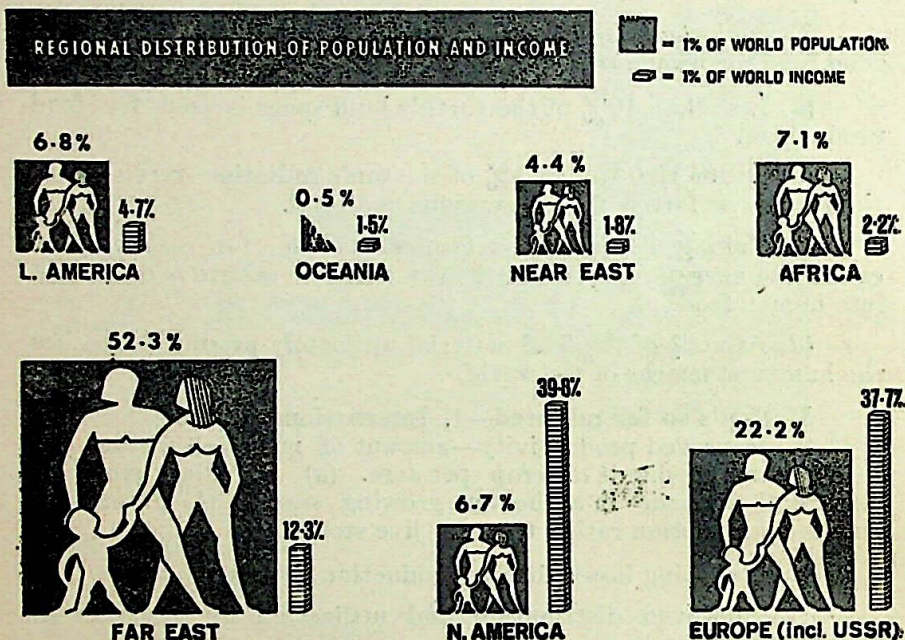


Fig. 8

There would appear to be some relationship between size of population and the level of technological progress. This relationship itself seems to substantiate certain implications of the law of limits. As human populations increase up to a certain point, the greater demand for goods and services seem to furnish an incentive to invent new commodities and new ways of doing things. But beyond this point, the "dead weight" of population pressure seems to put a premium upon security at the expense of the risk that goes along with inventiveness.

Population and National Income—A comparison of national incomes gives a picture of the distribution of wealth throughout the world and shows that the greater part of mankind is, relatively, very poor. The Far East, with 52.3 per cent of the total world population, has only 12.3 per cent of the world income. Africa, with 7.1 per cent of the population, has 2.2 per cent of the income. Latin America has 6.8 per cent of the population, but only 4.7 per cent of the total income. On the other

hand, Oceania, with only 0.5 per cent of the total population, has 1.5 per cent of the total income. North America and Europe, of course, are the wealthiest. North America, with 6.7 per cent of the population, has 39.8 per cent of the income, and Europe, with 22.2 per cent of the population, has 37.7 per cent of the income.

If the poor countries could increase their incomes, they could buy more goods and services from the technically developed countries to help their own development. But, with ever-increasing populations, the tendency is for them to become poorer while the others become richer. The problem can only be effectively tackled on an international scale. This means that the technically advanced countries must provide machinery, equipment and supplies, supported by technical advice and assistance to help the underdeveloped countries to help themselves. They cannot overcome this problem on their own. This is a long-term task of immense magnitude, but one that is the corner stone of the progress of all mankind.

World Population and Gross National Product—More than 10 per cent of the country's gross national product (GNP) is needed for investment to maintain a constant level of per capita income. The absorption due to population growth is less than 5 per cent for developed countries like the U.S., France, Sweden, the U.K. and West Germany.

Though India comes next to China in world population, it ranks only 131 in terms of per capita gross national product among the 154 U.N. countries with a population of one million or more. With a per capita GNP of \$ 90, India occupies a rank of 22 among the 25 Asian member countries of the United Nations.

The United States with a per capita GNP of \$ 3520 is the richest country in the world followed by Kuwait (\$ 3410), Virgin Islands (\$ 2320) and Sweden (\$ 2270) in that order.

One fifth of the total world countries have a per capita GNP of \$ 200 to \$ 300, and another one-fifth have \$ 50 to \$ 100. Nearly 90 per cent of the European countries are rich.

There are only 48 countries in the world with a population of more than ten million each. Although about half the people of the world live in six countries, only two of these big six have a per capita GNP of more than \$ 100.

At the other extreme, are a cluster of poor nations in Africa. In this region about half of the countries covered appear to fall in the per capita GNP range of \$31 to \$ 100.

The United States with a per capita GNP of \$ 3520 is 88 times richer than the poorest country and 40 times the richer than India. Whereas the least per capita GNP of an European country is \$ 280, it is \$ 40 for an African country. Among the 154 member countries for which complete data are available, 32

have a per capita GNP of less than \$ 100, 52 have a per capita GNP of \$ 100 to \$ 300 and 28 have more than \$ 1000.

Though India has double the population of Japan the per capita GNP of ours is only one-tenth of Japan.

The poverty of the low-income group implies, apart from the political and institutional background, a high rate of population growth in the face of a low rate of capital formation. Underdeveloped countries show as much variation in the ripeness or suitability for economic development, as they do so in other respects. Capital is an important but not the only ingredient for economic development.

It is universally true that the investment necessary for a stipulated rate of growth should provide not only for the normal rate of expansion but for the increase in population. The following tables indicate the extent to which some countries have to invest (as a proportion of its income) in order to keep per capita income at a constant level. This gives a general idea of the resources that are to be 'wasted' for the growth of population. It is seen from this table that for all developed countries the proportion that is wasted on this account is less than 5 per cent., while for some underdeveloped countries the ratio is above 10 per cent.

Table II : 5. Countries with a Population of 50 Million and above

<i>Country</i>	<i>Population * (in million)</i>	<i>Percentage to total</i>
1. China (mainland)	710.0	21.1
2. India	498.7	14.9
3. U.S.S.R.	233.1	6.9
4. U.S.A.	196.9	5.9
5. Pakistan	117.0	3.5
6. Indonesia	107.0	3.1
7. Japan	98.9	2.9
8. Brazil	83.2	2.5
9. Germany (Fed. Rep.)	59.7	1.8
10. Nigeria	59.7	1.8
11. U.K.	54.7	1.6
12. Italy	52.0	1.5
13. Other 180 Countries	1089.1	32.5
Total Population	3360.0	100.0

*** Mid-1968 figures.**

Table II : 6. Proportion of GNP that has to be invested in order to keep per Capita Income at a Contant Level in Various Countries.

Oves 10%	Colombia, India, Morocco, Brazil, Ghana, Tunisia.
7.5-10%	Malaysia, Peru, United Arab Republic, Thailand, Mexico, Phillipines, Turkey.
5-7.5%	The Sudan, Pakistan, Nigeria, Indonesia, South Korea, Chile, Ethiopia.
Less than 5%	United States, Norway, France, Sweden, Denmark, Finland, West Germany, Italy, the United King- dom, Belgium, Austria, Greece, Portugal.

Source :—Finance and Development March, 1969.

For countries like Pakistan, Sudan, Chile and Indonesia the absorption of GNP was less than 7.5 per cent. In the case of Thailand, Turkey and UAR it ranged from 7.5 per cent. to 10 per cent.

The rising amount of resources absorbed by the population growth at a time when these developing countries face an idleness of unused natural resources or their partial or limited use, is alarming.

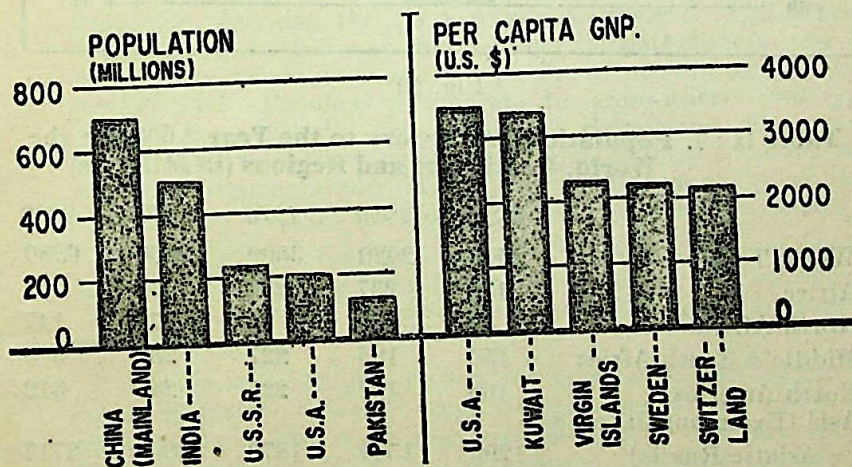


Fig. 9

There are many instances of known supplies of natural resources in various parts of developing countries lying untapped due to economic inaccessibility. Translated into policy terms, this points to an urgent need for a population policy in the developing countries.

6. WORLD POPULATION CYCLE

Population projections made by the U.N. for the years upto 2000 A.D. for the World by continents and regions would be clear from the following diagram and table :—

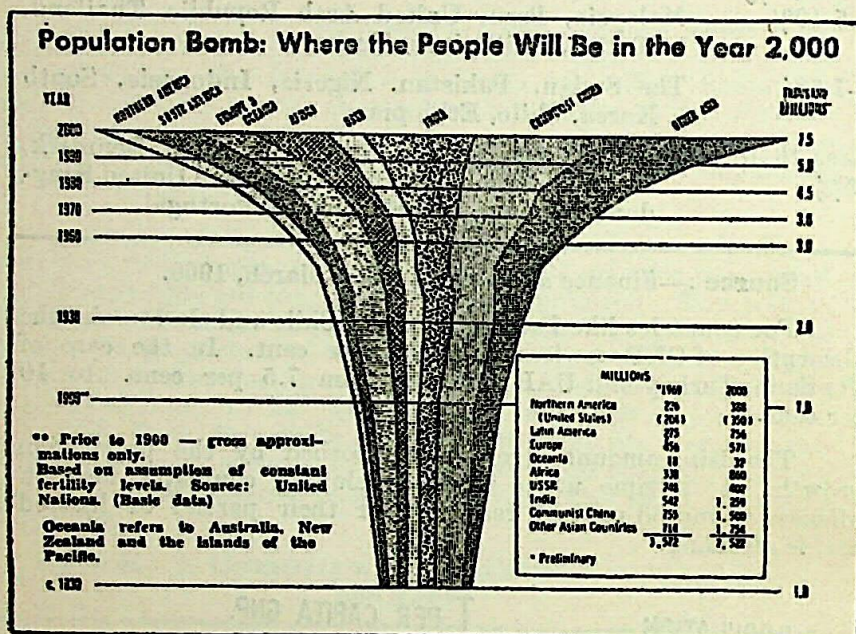


Fig. 10

Table II : 7. Population Projections to the Year 2,000 for the World, Continents and Regions (in Millions)

	1950	1960	1970	1975	2000
World Total	2500	2920	3500	3860	6280
Africa	199	237	294	331	517
North Africa	43	53	67	76	147
Middle & South Africa	156	185	227	254	370
North America	168	197	225	240	312
Asia (Excluding Japan & Asiatic Russia)	1296	1524	1870	2093	3717
Japan & Ryukyu Islands	84	96	110	117	153
Europe (Extending the European Part of the Soviet Union)	393	424	457	476	568
N. & W. Europe	133	140	148	154	180
Central Europe	128	140	151	156	183

South Europe	132	144	158	166	206
Oceania	13.2	16.3	19.4	21.0	29.3
Australia & New Zealand	10.2	12.7	14.9	16.0	20.8
Pacific Islands	2.9	3.6	4.5	5.0	8.6
Soviet Union (Asiatic & European Parts)	181	215	254	275	379

Although population is increasing in almost every country of the world, the rate at which these increases are occurring are far from uniform. Several important factors have contributed to the large and rapid population growth on earth. Three of these factors are in the field of public health, food production, and industrialization.

In the last 200 years infant mortality has dropped from 200 per thousand to 30 per thousand. In the industrialised nations, six children out of seven born who would have died two centuries ago, now survive. Death rates have fallen from about 40 per thousand to 12 per thousand. Life expectancy at birth has increased from about 30 years to 65 years. The most important factor which has made this improvement possible has been in the field of public health. Many diseases have been totally eliminated from human populations or reduced to the incidence of minor diseases.

At the same time, food supplies increased, food production improved steadily due to the success of modern agriculture.

The Industrial Revolution was important because it also helped to increase the food supply per person. The Industrial Revolution provided a system for the transportation of the food from areas where it could be produced to the areas in which people lived. People could migrate to areas where employment possibilities existed. The Industrial Revolution also made it possible to mechanize agriculture, and enabled countries which were developing an industrial economy to buy food in exchange for manufactured goods. People shifted from rural to urban areas.

The Political and Economic Planning Organization of London has described the population cycles in Western Europe. The cycle has four stages which are illustrated by examples from England.

In **stage one**, a highly fluctuating population existed 200 years ago in England; it is still occurring in other areas. During this state there is a high birth and high death rate, both greater than 35 per thousand. This is accompanied by a slow and irregular increase in population.

The **second stage** is called the early expanding. For example, in England 200 years ago, the death rate began to fall rapidly while the birth rate remained rather constant for another 100 years. During the end of that period, births were about 34 per thousand and deaths about 21. This gave an annual natural

increase of about 13 people per thousand. During the last 130 years period the population trebled.

The Third Stage was the late expanding stage, which England reached in 1880, when birth rate began to fall rapidly—with the result that after 50 years it was 16 per thousand and now it is 12 per thousand.

During the 50 years period, population increased by more than half.

The Fourth Stage is the low fluctuating stage. After 2nd World war there was a sharp rise in the number of births and death rates but it soon became stable again at about 16 and 12 per thousand respectively.

Western Europe saw a 6 fold growth in population in 300 years. With the Industrial Revolution and there was a Comparable rise in the standard of Developments in Science living, present rate of growth in Western Europe being 7 per 1000 per year as compared to the present rate of growth of 16 per 1000 per year in North America. While great increases in populations following wars have been a naturally occurring phenomenon in the past history of mankind, 2/3rd of world's population (mostly underdeveloped nations) have reached only the first or second stage in the population cycle. Death rates are often still high. Rapid population growths can occur in the near future.

Public health improvements have raised the general level of health, strength, energy and well-being of people in the industrialized nations of the world. We have achieved but a fraction of the potential for human progress. Therefore extent of poverty and the needs of the people of the world body is stupendous.

7. POPULATION CONTROL

In a broad sense and for the longer run, the whole world has the "population problem": space itself is a factor in the quality of life, even for the rich. But the most pressing problem is the way in which unusually fast population growth distorts the age structure and diverts an excessive proportion of national savings away from productive investment in less developed countries, retarding their economic and social development.

The rates of population growth, (fertility less mortality rates) are unique in history: man has never multiplied so fast. This results from progressively lower mortality rates, thanks to modern public health technology, while in most areas no comparable success has been achieved in reducing fertility. More and more countries are now attempting to apply available technology to the reduction of fertility with some promising results. At the present time, however, this appears to be making less progress than the control of mortality, and more countries will be confronted with a "population problem" as their death

rates decline ; this will be true especially in countries with birth rates of more than 40 per thousand.

The effects of this spread between fertility and death rates are now most notable where economic development has not progressed far enough to generate the automatic downward pressure on fertility which, historically in the more developed countries, has tended to accompany rising affluence. The impact on age distribution has many implications. More than 40 per cent of the population in South Asia, Africa and Latin America is under 15 years of age. In these circumstances there is a high ratio of dependents to the productive labour force and a rising proportion of childbearing women in the total population.

There appears a need for cultural progress to control our numbers within the limits of our capabilities to supply the people with their minimum essentials for a decent life.

There are at least three courses of action seen working. **One**, there is the biological control present and found widespread in the world in biological systems. There is no reason to suppose these do not also apply to man. **Two**, there is an economic factor at work, for certainly the standard of living influences population growth. And **Third**, there are cultural factors at work which permit or resist gains that must be made.

As Hertzler (1958) has pointed out, we must reassess our views of human destiny and of human demands. He asks, "Are great quantities of persons and things our main goals ? Or, is the quality of human life—the good life for each individual and for mankind as a whole—the ultimate objective ?" If the major objective, according to Hertzler, is to fully develop the personalities of human beings, this in turn means that the fullest and most harmonious exercise of human facilities and powers, the fullest utilization of the richness of human culture. It would imply the achievement of an ascending scale of values from material and biological to the intellectual and the spiritual. It would imply a richer and wider flowering of the higher qualities that make up man's uniqueness, his intelligence, his creative powers, his moral sense.

We, in general, desire to promote the good life for all races, creeds, classes, and climes. As Hertzler indicates, such a quality of living cannot be achieved in a beehive. Human life can be vastly more than breeding, grubbing and feeding. The world must be looked upon as a good place for human beings also for the ages to come. To achieve this goodness the world requires surpluses instead of shortages. Hence, there is much to be said in favour of policies which tend to stabilize the world population as a guide for the immediate future. This would enable the peoples of the earth not only to move towards the universalized physical optimum, but also to realize and enjoy the highest known reaches of

social well-being and opportunity, and of intellectual and spiritual development. This is the kind of society young and old are thought to desire for the future.

Because of the interdependence and interlocking between nations and peoples, population problems anywhere are world problems. The present crisis in human reproduction rates in relation to existing resources involves all the people of the world.

There appears to be a widely held idea concerning the necessity for a world-wide limitation in human populations. The peoples of the world, however, differ in the means of achieving such a stability in the population.

Economic Control of Population—If we accept the general idea that the standard of living of a family is equal to the resources it has multiplied by what use it makes of these resources and divided by the number of people in the family unit, we could write this in the form of an equation:

$$\text{Standard of living} = \frac{\text{resources} \times \text{use} \times \text{level of technology}}{\text{number of people in family}}$$

While this is not an absolutely balanced equation, most people accept the general idea presented. If we accept this equation, we could write it in another way:

$$\text{Number of people} = \frac{\text{resources} \times \text{use} \times \text{level of technology}}{\text{standard of living}}$$

In other words, one control of populations is the standard of living of the people who make up the population. For most of the population, a higher standard of living permits greater sociability, and large family units tend to restrict social men and women.

There can be little doubt that the standard of living and economic conditions influence the size of populations, be they family units, nations, or continents.

A steady rise in the living standards of the underdeveloped countries is important to the whole world. All underdeveloped countries today are making efforts to increase their food supplies. Few are making any organized effort to control the growth of their populations. Unless population growth can be controlled, living standard will continue to fall. A serious effort must be undertaken to slow the rapid growth in human populations.

The choice appears to be between a great quantity of human life on earth or a higher quality of human life on earth.

Major Natural Regions of the World

1. CLIMATES OF THE WORLD

The climate of a place is the sum total of the weather conditions that prevail for a considerable period of time. We know that climate influences vegetation and both these factors influence the animals that are found in that place. All these factors form the 'geographical control' and exercise a very deep influence on man and his activity. Thus it is clear that climate is of fundamental importance and it depends upon temperature and pressure of the air, direction of the wind, rain-fall, clouds and sun-shine. All these factors determine the climatic conditions which differ in the world from country to country or even from place to place within the same country. It has, however, been seen that although climate changes from place to place, there are certain areas on the surface of the earth which have the same climate or almost the same climate even though they are situated at a distance of thousands of miles. The countries round the Mediterranean sea enjoy a certain type of climate and we find very much similar climate in California in North America even though the distance between the two parts is several thousand miles. On the basis of this similarity, Prof. Herbertson conceived the idea that the world should be divided into a set of 'natural regions' on the basis of climate. By natural regions, we mean an area of earth surface which is essentially homogenous with respect to the conditions that affect human life. In a natural regions, we find almost similar type of climate, vegetation and principal human activity. Within the same natural region, physical features may differ but the climate is the same. Since climate has a great influence on vegetation and on man's activity, the best approach was felt to be to divide the world into climatic regions.

Temperature Zones of the Earth—On the basis of temperature and the distribution of solar heat on the surface of the earth, the earth has been divided into five zones : Torrid Zones, North and South Temperate Zones, Arctic and Antarctic Zones. According to Koeppen, these may be organised into four zones. *The tropical zone* where the temperature all the year round is above 68° F; *The sub-tropical zone* where the temperature for a few

months varies between 50° to 60° F ; *the Temperate zone* where the temprature throughout the year ranges between 50 to 60° F and *the Cold zone* where the temperature is always below 50° F. These zones, however, present a very hazy or general picture of the earth. Therefore, a more elaborate classification of the climatic regions of the world was given by Dr. Koeppen on the basis of the number of weather elements. Temperature and rain-fall have the greatest importance. This classification also recognizes the differences between east and west or between the interior of the continents and the coastal situations. This divison will be clear from the chart given on the next page.

Food Self-Sufficiency in the Various Climatic Regions—

The different natural regions have different densities of population and different stages of self-sufficiency in food-stuffs. Before we consider the question of self-sufficiency in food stuffs, we must see what are the different varieties of food articles that man consumes. Cereal crops, of course, occupy the greatest importance but as the standard of living goes up, man begins to consume more and more quantities of animal foods such as meat, milk, butter, cheese etc. on the one hand and non-cereal crops like tea, coffee, sugar, cocoa etc., on the other.

The growth of vegetation depends to a large extent on moisture, the amount and season of rainfall, but the charcter of vegetation depends on the combined effect of heat and moisture. Some people maintain that soil fertility is also a factor in the production of vegetation. But, as we all know, all soils are more or less fertile and soil fertility may also be increased artificially.

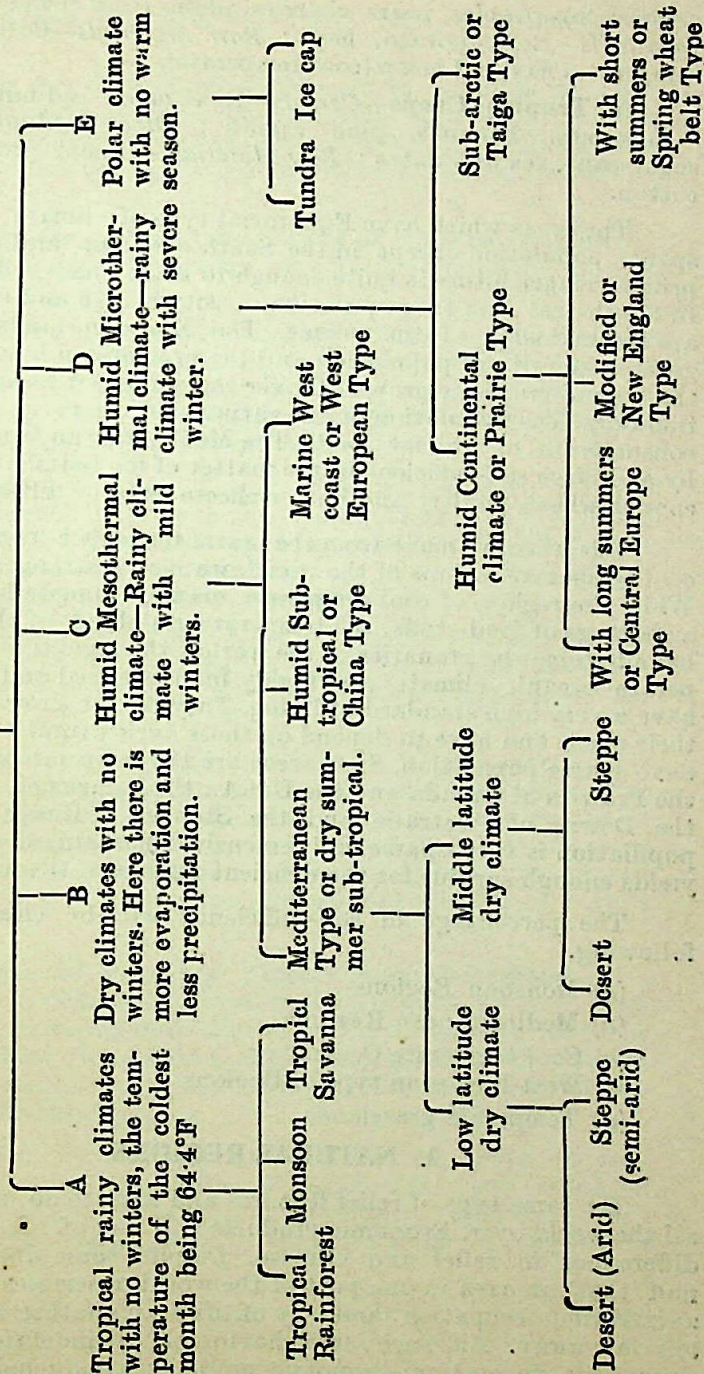
Climate and Production of Raw Materials—The production of raw materials is very largely determined by climate. The following table shows the effect of climate on natural vegetation :

Type	Tropical	Temperate
(a) Forests.....	Equatorial and monsoon forests of hard wood variety.	Deciduous and hard wood as oak ; Coniferous or soft-wood as pine, fur.
	Products—mahogony ebony, teak, rubber.	
(b) Grassland.....	Savanns	Prairies, Steppes, Pampas, Veld.

The cultivated crops are grown under a wide range of climatic conditions, but they cannot be produced on a large scale every where. Production of a crop on a commercial basis is limited to a specific climate.

(a) **Temperate Crops**—*Cereals*—Wheat, barley, rye and oats ; *Fruits*—lemons, grapes, grape fruits and currants (warm

Koeppen's Division of Climate Types



temperate)—Apples, pears, cherries, plums (cold temperate); *other foodstuffs*—Beet, potato, hops; *Raw Materials*—Cotton (warm temperate) flax and hemp (cool temperate).

(b) **Tropical Crops**—*Cereals*—Rice, maize and millets; *Fruits*—Coconuts, bananas, pine apples; *Other Foodstuffs*—Coffee, sugar-cane, tea and dates; *Raw Materials*—Hemp, ground nuts, cotton.

The areas which have Equatorial type of climate have very sparse population except in the South-east Asia and as a result, primitive agriculture is quite enough to make them self-sufficient. In South-east Asia the population density is high and cereal crops are the mainstay of the people. The Monsoon lands have the greatest density of population and the pressure on land is so high that cereal crops are grown all over the region for local consumption only. The population is rice eating and there is very little consumption of animal foods. The Mediterranean lands are also by and large self-sufficient in the matter of food-stuffs. They grow enough wheat, poultry and butter-cheese as to be self-sufficient.

But when we move from the warm temperate regions to the cool temperate regions of the world, we find a strange situation. While the regions of cool temperate oceanic climate have always a shortage of food-stuffs, the temperate grassland of the interior have become the granaries of the world; the regions of cool temperate oceanic climate are highly industrialized and the people have a very high standard of living. They do not grow enough for their needs and have to depend on those agricultural areas which have sparse population. Such areas are the temperate grassland—the Prairies of Canada and the U.S.A., the Pampas of Argentina, the Downs of Australia and the Steppes of Russia. There the population is very sparse and extensive mechanised agriculture yields enough surplus for the deficient regions of the world.

The percentage of self-sufficiency will be clear from the following.

(a) Monsoon Regions	98%
(b) Mediterranean Regions	90%
(c) Cool temperate Oceanic or West European type of Regions	60%
(d) Temperate grasslands	197%

2. NATURAL REGIONS

The same type of relief features and climate do not prevail all the world over. Economic products and way of life vary with differences in relief and climate. Despite these differences, we find that an area in one part of the world resembles in climate, animal life, occupation, and way of life with another area situated far away. All such areas having almost identical climate, animal life, vegetation, economic products are included in one

natural region and the whole world is divided into a number of natural regions.

According to Prof. Herbertson, natural region is 'an area of the earth's surface which is essentially homogeneous with respect to the conditions that affect human life'. Within one natural region climate, vegetation and ways of life are more or less similar.

Conditions for a Successful Study of Natural Regions—

In the consideration of natural regions the following points should be carefully noted :

(1) *One part of a natural region does not have exactly the same climatic condition as its another part.* It follows that there may be minor differences in the same natural region but still they may be included in one region. The region is at best an approximation of climate, vegetation and economic activities.

(2) *The region is a note of space.* The region is to the geographer what a century is to the historian. The region is a means by which the fluidity of space is examined statistically. The limits of a region are quite approximate. the change from one region to another region is not abrupt but very gradual.

(3) *The limits of a natural region are fixed by nature but the boundaries of a country are fixed by man.* Both boundaries are quite different. Generally a country contains more than one natural region.

The value of the study of a natural region is important for all of us because area in each region can be developed on similar lines. The Britishers could successfully grow rubber plant in Malaya simply because they knew that Malaya enjoys the same type of climate as Amazon Basin. Later on Indonesia also raised rubber and along with Malaya produced about 90% of world's rubber.

Advantages of Studying Major Natural Regions—This division of the earth into natural regions is quite different from the man-made division into continents and countries and it is also different from the political units—the nations of the world. There are several advantages in studying the geography of the world through natural regions.

1. Such a study discloses the influence of climate on man and points out the possibility of agricultural and industrial development in regions which are un-developed by making available to them the experience of development in similar regions at other places.

2. The study of natural regions also helps in immigration and emigration of man, determines the factors of settlement and guides the people where to go and how to settle.

3. This is in a way the general geography of the whole world and through this one comes to know of the resources or the difficulties that lie there. An example will make this very clear. North Australia is still un-developed and white people are afraid of going and settling there. This portion of Australia has got the monsoon type of climate and it can only be developed if the people from other monsoon regions who have experience of that climate, come and settle there. So long as Australia continues to follow its "white Australia" policy and does not allow black people to enter into the country, this region will remain un-developed. Neither the people of the colder countries can withstand the climate of this region nor do they have the experience of living and working in such a climate.

Herbertson's Classification—Koeppen's division of the climatic regions is very elaborate and takes into consideration even the minor local differences. Prof. Herbertson's classification was much simpler. He divided the world into 22 natural regions which are as given below :—

I. Very Hot Regions :

- (i) Equatorial Lowland Region.
- (ii) Hot Equatorial Mountain Island or Malaya Type.
- (iii) Equatorial High Plateaus of Equador Type.

II. Tropical Regions :

- (i) Western Deserts or the Sahara Type.
- (ii) Monsoon Region.
- (iii) Interior Lowlands or Summer Rain Type.
- (iv) Moderate Rain Plateaus.

III. Warm Temperate Lands or Regions :

- (i) Western Margins or Mediterranean Type.
- (ii) Eastern Margins or China Type.
- (iii) Interior Lowlands or Turan Type.
- (iv) Interior Highlands or Iran Type.
- (v) Plateaus with cold winters or Mountain Type.

IV. Cool and Temperate Lands or Regions :

- (i) Western Margins or West- European Type.
- (ii) Eastern Margins or St. Lawrence Type.
- (iii) Interior Lowlands or Siberian Type.
- (iv) Interior Highlands or Altai Type.
- (v) High Plateaus or Tibet Type.

V. Very Cold Regions or Polar Regions :

- (i) Norway Type.
- (ii) Kamachatka Type.

- (iii) Tundra Type.
- (iv) Yukon Type.
- (v) Greenland Type.

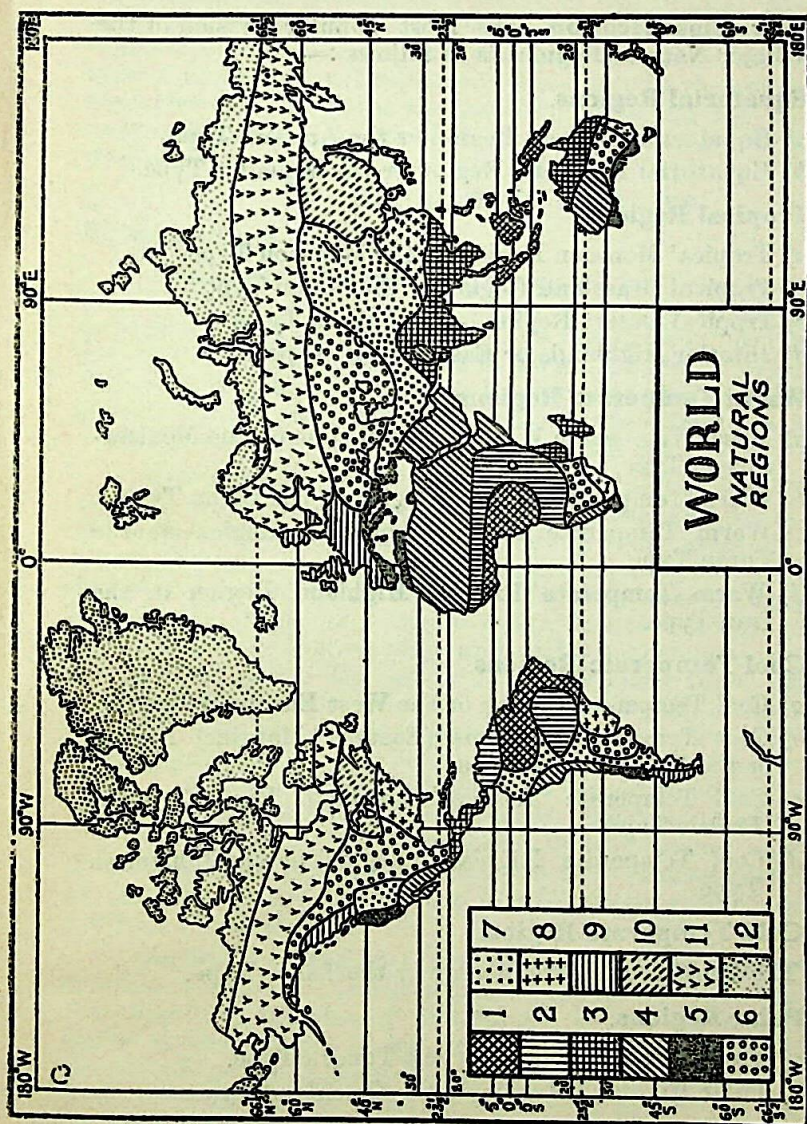


Fig. 12—Major Natural Regions [1. Equatorial Lowland Region. 2. Sudan Type. 3. Monsoon Type 4. Hot Deserts or Sahara Type. 5. Mediterranean Type. 6. Prairie Type 7. Temperate Deserts or Mongolian Type. 8. China Type. 9. West European Type. 10. St. Lawrence Type. 11. Taiga Type. 12. Polar Regions].

The most popular division of the world into major natural regions is, however, a slight modification of both these descriptions. This popular classification gives the broad division of the regions of the earth and leaves out the minor types which are not of much importance for the study of economic geography. These

natural regions present a study of the geography of the world in a nutshell. By means of them, we are able to study the general geography of the world and prepare a background for the economic development of man in different regions.

Popular Classification—The most popular division of the world into Major Natural Regions is as follows :—

1. Equatorial Regions.

- (a) Equatorial Lowland Region or the Amazon Type.
- (b) Equatorial Highland Region or the Equador Type.

2. Tropical Regions.

- (a) Tropical Monsoon Region or the Monsoon Type.
- (b) Tropical Grassland Region or the Sudan Type.
- (c) Tropical Desert Region or the Sahara Type.
- (d) Interior Highlands or East African Type.

3. Warm Temperate Regions.

- (a) Warm Temperate West Margin Region or the Mediterranean Type.
- (b) Warm Temperate Oceanic Region or the China Type.
- (c) Warm Temperate Interior Lowland Region or the Turan Type.
- (d) Warm Temperate Interior Highland Region or the Iran Type.

4. Cool Temperate Regions.

- (a) Cool Temperate Region or the West European Type.
- (b) Cool Temperate Oceanic (Eastern Margins) Region or the St. Lawrence Type.
- (c) Cool Temperate Interior Lowland Region or the Prairie Type.
- (d) Cool Temperate Highland Region or the Mongolian Type.

5. Cold Temperate Region.

The Coniferous Forest Region or the Taiga Type.

6. Polar Regions.

- (a) Polar Lowland Region or the Tundra Type.
- (b) Polar Highland Region or the Greenland Type.

Nomenclature of Different Natural Regions.—In the study of natural regions, we go beyond the political boundaries. But these regions are never water-tight compartments. There is a gradual transition from one natural region to the other. As one travels from one natural region into the other, one finds the climate

and vegetation of the region that he is entering mixed with those of the one he has left. There is also another point worth mentioning here. Sometimes a region is called after the vegetation that is found there. Sometimes it is named after the country where it is predominantly found and sometimes it is known by the type of climate that it represents. Whatever be the name, we must remember one thing that the basis is climate and the regions are essentially based on the factors of climate, vegetation, animals and human activity closely following on its steps.

3. EQUATORIAL REGIONS

Equatorial Lowland Region

Situation and Extent—The region lying between 5° North and 5° South of equator is known as the equatorial region and it is so called because of its nearness to the equator. Amazon basin in South America, Congo basin in Africa, Ghana in West Africa, Indonesia and Malaya in South East Asia are the chief areas included in this region. In Indonesia, the climate is, however, slightly modified due to the influence of the sea.

Climate—Because of the nearness to the equator, these regions are marked with high temperature and heavy rainfall throughout the year. The rays of the sun come direct all the year round and there is very little difference between the temperature found in summer and in winter. 80°F is the average temperature throughout. Seasonal change is insignificant—not more than 5°F. The difference between day and night temperature is also very small, hardly 2°F. The annual rainfall is more than 100 inches and its nature is convectional. In the early part of the day, the earth and the water are heated up by the direct rays of the sun and, therefore every day in the afternoon, there is heavy down-pour. Mornings are usually bright but the afternoons are cloudy. Thunder-storms are the usual feature. Because of extreme heat and excessive rainfall, the weather is usually steamy and sticky. Amazon basin in South America is the most characteristic region of this type of climate and that is why these regions are often known as Amazon type.

Natural Vegetation—Due to constant heat and excessive rainfall, there is a luxuriant growth of vegetation and the humidity is so high that the ground underneath is usually marshy. The region is covered with dense ever-green forests. The trees in these forests are tall and possess broad leaves. The trees grow so near each other that it is difficult to move through the forests. The tree tops only have a cluster of leaves and on the branches are found creepers and parasitic plants. These creepers are often stronger than the ropes of the best kind. The under-growth is also thick and bushy. Because of these factors, the atmosphere in these forests is damp and dark. One cannot move through them easily. These trees are of hard wood. Mahogany, rubber and ebony are the chief trees. Bananas and pine-apples also grow.

A keen struggle for sun-light is seen in these forests and the ground below is scattered with decaying trees and plants. There is another defect also in these forests. Trees of different variety are found clustered and it is very seldom that trees of one type grow over a considerable area. As such, if one has to exploit the timber or other resources, one has to move for long distances in order to locate the trees and moving is a great problem.

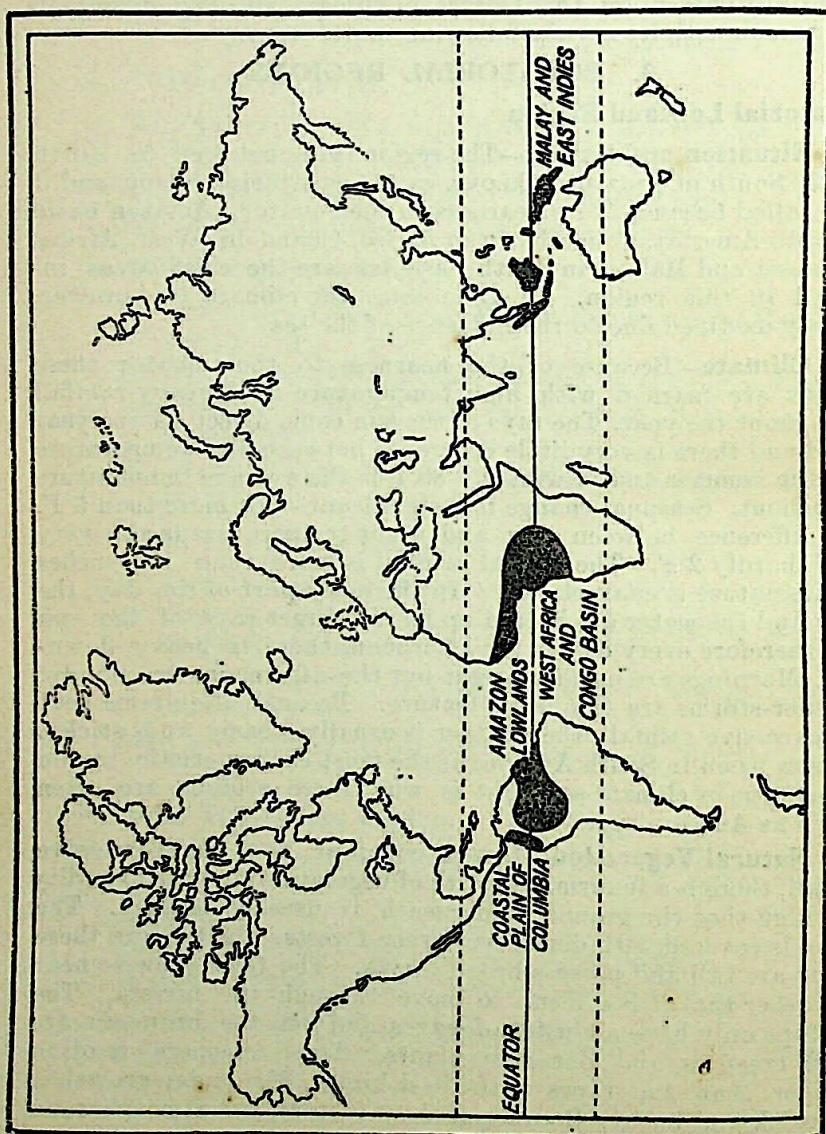


Fig. 13—Equatorial Regions

Animal Life—Depending on the vegetation, the animals found here are usually such as can go from tree to tree or can fly through this dense growth of vegetation. Animal life exists on

the branches of the trees and monkeys, birds, lizards, snakes, tree-frogs are the most important. Besides this a large number of poisonous flies and insects are also encountered.

Economics Activity and Natural Resources—Equatorial regions are usually deficient in mineral resources. Due to hot and moist climate which encourages luxuriant vegetation, there is absence of agricultural activity. It is only on the outskirts of these forests or near the coast that extensive agriculture is practised and oil-palms, bamboos, rubber trees, rice, coconut, plantains, bananas and spices are grown. The only region where considerable agricultural development has taken place is South East Asia—Malaya and Indonesia. As regards mineral resources also, that is the only region where some exploration and subsequent exploitation has been possible. Congo basin is also very rich in minerals and copper has been specially exploited there. The chief reason why no headway has been made in the development of economic resources in this region is that the sticky hot climate does not allow the white settlers to come and settle down. Then the vegetation is so dense and the means of transport towards the inside are so difficult that it is very hazardous for man to dare to enter. In Indonesia and Malaya the development is taking place only because this region is approachable by sea from all sides and the Dutch settlers in Indonesia and the British settlers in Malaya have been responsible for the development of the resources. Malaya produces 66% of the world's tin ; Borneo produces petroleum, while Java and Malaya have developed sugarcane and rubber plantations on the most scientific basis. Excepting these, all other regions are still in a most backward state and not much development has taken place there.

Human Life—In Equatorial regions, climate is detrimental to human health and the aboriginal inhabitants of this region are stunted, both physically and mentally. The American Indians of the Amazon basin and the Pygmies of the Congo basin are hardly 4 ft. in height, very dark in complexion, hardly wear any clothes, build no houses and run away at the first sight of a stranger. They are hunters and fishermen, who go on shooting animals with their poisonous arrows. Fruit, fish and flesh which can be got here easily are the chief articles of their food and they are indolent by habit. Besides hunting, they now gather the tropical produce of this region as rubber in the Amazon basin and ivory in the Congo basin. They bring these produce near the shore where they exchange them for other things with the foreigners.

Difficulties of Living—Hot climate, lack of suitable manpower, insufficient facilities of transport and communication, lack of industrial power and great distances from the world markets have been the chief hurdles in the way of exploitation of resources of this region. Several types of fever brought about by the bites

of flies and insects have to overcome before man is able to settle down and start any economic activity.

South East Asia : An Exception—The only region where commercial and industrial development has taken place is Indonesia and Malaya Peninsula. In these regions, as has been said above, their accessible situation and the enterprise of the westerners have been mainly responsible. The lands have been cleared of the dense forests and plantation agriculture on commercial scale is carried on. Rubber, pepper, coffee, sugarcane, cincona, tobacco, coconuts, and sago are the chief products of Malayan agriculture. Borneo and Sumatra export rubber, pepper and coffee. Celebes and Moluccas are world famous for their spices. Java is a great producer of sugarcane and rice. These areas also produce important minerals and several industries for processing these minerals and agricultural produce have come to be established.

Prospects for the Future—At the present moment great changes are taking place in the Equatorial regions of Africa also. Owing to the influence of the Belgians and the British, the people of Congo and Ghana have cleared off the forests and have established plantations of cocoa, rubber, groundnuts. Gold, tin and copper mines are worked by foreign companies. Railways, motorable roads and good harbours have been built. Once Congo and Katanga settle down by ironing out the differences, this region will also march on the road to progress.

Equatorial High Land Region

In the Equatorial regions wherever the land is high, the effect of the elevation is seen in modifying the climatic conditions. Within the Equatorial belt there are certain lands which are situated at a height of 8,000 to 10,000 ft. above the sea level. The effect of the elevation is that there are lower temperatures and the range is slightly greater. Rain falls throughout the year but the total is not as much as in the lowland region. Ecuador is the most characteristic area of this climate and therefore, sometimes this region is known as Ecuador type. Because of the slight modification in climate, the vegetation is also different. There are no thick forests and in places where man has been able to live, temperate crops like wheat, barley, maize and vegetables are grown. The land is mountainous and so the chief animals found here are cattle, goats and lamas. This region is rich in minerals but commercial exploitation has not been possible so far because of sparse population. The chief occupation of the people is agriculture combined with animal rearing and lumbering.

4. TROPICAL REGIONS

The tropical regions consist of the tropical monsoon region known as the monsoon type of climate ; tropical grassland region,

known as Sudan type of climate ; tropical desert region, known as the Sahara type of climate and the tropical interior highland region known as East African type of climate. The Monsoon and Desert types are, however, the most important.

Monsoon Regions

Situation and Extent—As we move from 20° North and 20° South towards the poles, on the eastern coasts of the continents, we find regions which are visited by one type of wind system during the summer months and come under the influence of another wind system during the winter months. 20° to 30° North and South of Equator is the extent of these regions which stand on the eastern margins of the continent, India, Burma, Siam or Thailand, Indo-china and South China are the most important areas included in this region. Besides these areas, almost similar climate with a slight modification occurs in North East part of Australia, Central America, Mexico, West Coast of Africa and the Carribean Sea Islands. Since all these regions depend for their climate on seasonal winds, they are known as *monsoon regions* and their climate is known as monsoon type of climate. Monsoon comes from an Arabic word called '*Mausim*' which means season and, therefore, the idea of dependence on seasonal winds is conveyed through this name.

Climate—This region is situated very close to the Tropic of Cancer in the Northern hemisphere and Tropic of Capricorn in the Southern hemisphere. We know that the sun shines vertically on the tropics once a year. So, for one part of the year, the temperatures are very high and for the next part when the sun is away, the temperatures are low. The variation of temperature helps in forming high and low pressures on certain areas on the landmass and these are able to change the direction of prevailing winds.

The monsoon lands have three distinct *seasons* :

(1) Hot season or the hot dry monsoon season, when there is no rain but there is great heat. This lasts from February to the beginning of June.

(2) Rainy season, when the rain bearing winds are drawn and they come rushing across the ocean and strike the shores of the land masses. According to the physical features of the land, the rainfall varies from a few hundred inches near the coast and mountains to only a few inches in the interior. In India when the south-west monsoon strikes the shores of Eastern India or enters Bengal, over 110 inches of rain is recorded. Cherrapunji gets about 250 inches of rainfall every year. But as we move from east to west, the rainfall goes on declining. The rainfall is also more near the mountains and less away from them. Rainy season

lasts from almost the middle of June to October. This may also be called the wet monsoon period.

(3) The winter season or the cool dry monsoon period lasts from November to February and except for certain areas where stray cyclones are able to reach as in north-west India or where the returning north-east monsoon reaches after crossing some bit of sea, there is no rainfall.

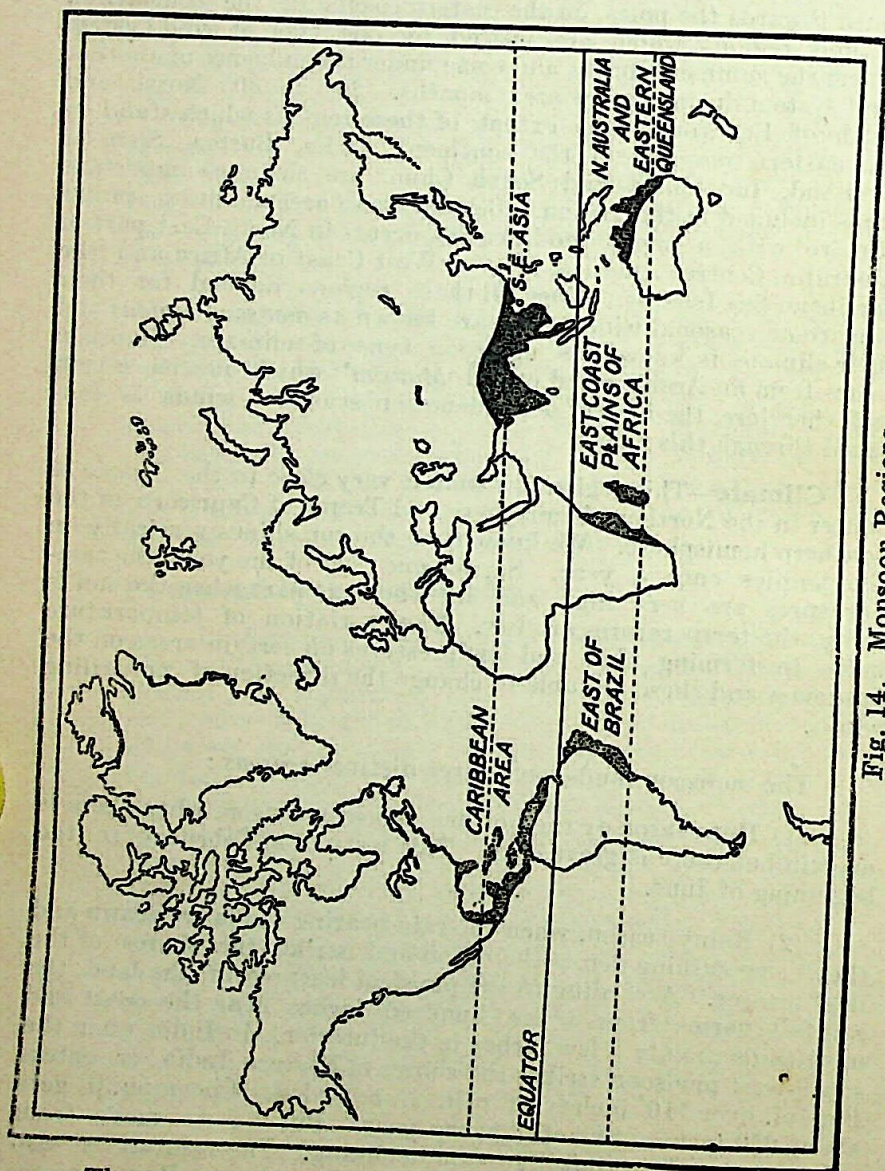


Fig. 14. Monsoon Regions,

The temperature in the hot dry monsoon period, i.e., from

February to June is continually rising and except near the coast where the influence of the sea is felt, it goes beyond 110°F in most parts of northern India. At that time, hot and dust raising winds blow and life and activity is almost at a stand-still. With the coming of the rains, the temperature is lowered and while on the one side people welcome this lowering of temperature with a sigh of relief, on the other hand, a number of diseases like malaria, dysentery, etc., break out during the rainy season. The lowering of temperature goes on till in late October it becomes quite cool and at certain places of north-west India, temperature even comes down to 60°F. The average temperature is about 110°F for the summer and 75°F for the winter. The winter sky is clear and bright and there are frequent changes or shift in the winds.

Natural Vegetation—The vegetation in monsoon lands is determined by the amount of rainfall because the temperatures are suitable for plant growth all the year round. In those places, which have more than 80 inches of rainfall, we find ever-green forests but they are not so thick as those found in the equatorial regions. Teak, Sal and the bamboos are the most important trees of the monsoon forests. Besides a large number of secondary products like lac, resin, oils, herbs, etc., are also yielded by these forests. Where the rainfall is between 40 to 80 inches, lands have been cleared for agriculture and there are two growing seasons which are known as *Kharif* and *Rabi* in India. Mostly food crops are grown—rice, jute and sugar-cane in the wet parts and wheat, maize, barley, millets in the dry parts. Tea is also an important product of monsoon regions, north-eastern India and south-eastern China being the most important.

A variety of animals are also found in large numbers. Cows, buffaloes, sheep, goats, pigs and horses are domesticated while lions and tigers are found in forests. In spite of this large animal wealth, monsoon lands have not been able to develop any dairy farming because the dry monsoon period for about eight months in the year does not encourage the growth of grass and if cattle are kept, they have to be stall-fed for a major part of the year and that is very expensive.

Natural Resources and Economic Development—Most of the monsoon lands are very rich in minerals. Copper and tin in Central America ; copper in Carribean Sea Islands ; oil, lead, silver and tin in Burma ; copper, tin, lead, and silver in South China indicate the variety and richness of the minerals found here. The richest in mineral wealth is, however, India which has deposits of coal, iron ore, mineral oil, mica, manganese, salts and gold. These minerals and the fertile soil that exists in the river valleys of these monsoon lands holds out a very great promise for the future economic development.

Most probably, it was due to these conveniences of life present in the environment of the region that the human beings

evolved a rich culture over the years. Man's struggle with nature was not hard and, therefore, monsoon, lands of the world came to be great centres of ancient civilization and religions. Buddhism, Hinduism and the great Indian civilization had their birth in the monsoon land, known as India. But side by side also came the growth of population so that now-a-days monsoon lands of the world are the most thickly populated regions. The density of population is about 500 people per sq. mile. Because of this dense population, the chief occupation of the people has been agriculture and that too is mainly dependent on rainfall. The agricultural methods are also old and most of it is subsistence farming. As the pressure of population on land is very great, these regions largely grow food crops and there is a very keen competition between man and the animal, both for the space to live in and the food to eat. The result is that in spite of these resources, monsoon lands have remained under-developed and there has always been a struggle between the growing population and the resources of nature. Even now it is felt that this huge population is a challenge to any sort of developmental planning. Gradually, however, development is taking place and the crops grown in this region are of much greater variety than those found in any other natural region. Recently, industries based on agricultural and mineral products of the region have come to be established and in that connection the name of India deserves special mention. The only monsoon land which still remains sufficiently backward is that found in North Australia where the resources do exist but the white people who are allowed to settle there do not find it healthy or convenient to carry on any economic activity.

Tropical Desert Regions of Sahara Type

Situation and Extent—Within the same limits as the monsoon climate is found on the eastern margins of the continents, on the western side of the land masses is found the climate which is hot and dry. The tropical deserts of the world are situated between 20° and 30° latitudes North and South of the Equator. The Atacama desert of South America, the Colorado desert of North America, the Sahara of Africa, Arabian desert, the Thar desert of India, the Kalahari of South Africa and the great Australian desert of West Australia are the most important areas of this type of climate. Sahara region is the most characteristic and, therefore, this type of climate is often known as *Sahara type of climate*.

Climate—These lands are so situated that for part of the year, they are under the influence of low pressure area where the air current is descending and for some part of the year north-east and south-east trade winds blow across them. As a result of these two factors the rainfall in this region is very low. There is very little cloudiness and sun shines brilliantly throughout the day. Days are very hot and nights are very cold. The day temperature often rises to several degrees over 100°F, while the night experiences frost and heavy dew. The physical features are mostly low-

lying and it is seldom that we find the temperatures modified by altitude. High temperature is marked by extremes and there is a general absence of rain. Sometimes there are cloud-bursts and so much rain falls that the areas are even flooded. These are the chief factors of the climate of desert regions.

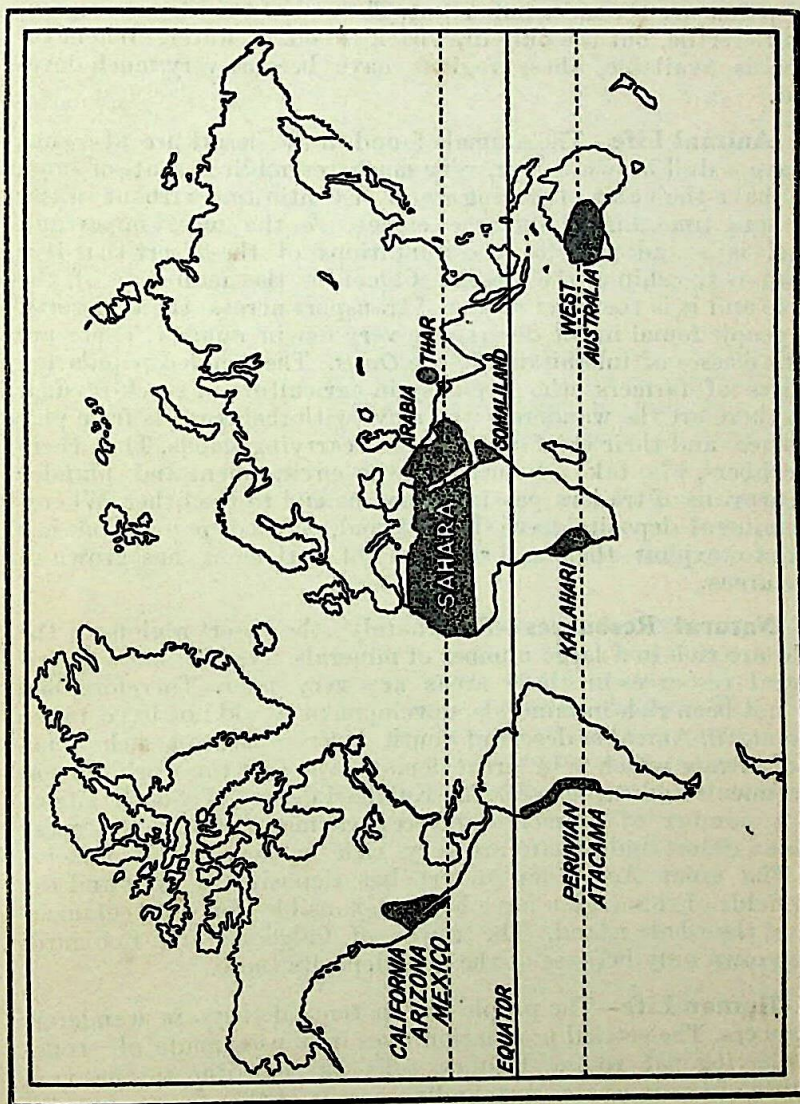


Fig. 15—The Hot Desert Regions.

Natural Vegetation—Because of the lack of rain, the vegetation is very poor. Very few plants are found and only those plants grow which can either store water in their roots and stems

or which can resist evaporation brought about by the rays of the sun. Thorny trees and cacti are the most important. For miles and miles there is nothing but sand or bare surface. Whenever underground water is available, pockets of population come to be established. These areas are called *Oasis* and there we find cultivation of fruit and food crops. Wheat, millets and the date-palms are the most important. The soil of the desert regions is quite fertile, but the only drawback is lack of water. Whenever water is available, these regions have become very much developed.

Animal Life—The animals found in the desert are also such as have a dull brown colour, very much resembling that of sand. They have the habit of storing water or continuing without water for a long time. Lizard and the camel are the most important. Camel is so adapted to the conditions of the desert that it is known as the ship of the desert. Camel is the mainstay of the people and it is the chief means of transport across these deserts. The people found in the deserts are very few in number. There are four classes of inhabitants in the *Oasis*. The settled population consists of farmers who are busy in agriculture of stock-raising. Then there are the wanderers who move with their camels from place to place and their chief occupation is carrying goods. Then there are robbers, who take advantage of the environment and plunder the caravans of traders passing from one end to the other. Wherever mineral deposits have been found, settled population has come to exploit them and some sort of settlement has grown in those areas.

Natural Resources—Fortunately, the desert regions of the world are rich in a large number of minerals. As we know, agricultural resources in these areas are very poor. Therefore, had they not been rich in minerals, development would not have taken place at all. Atacama desert of South America has got rich deposits of nitrate which is in great demand all over the world for use in chemicals and explosives. The Kalahari desert of South Africa has a number of diamond and copper mines while the great Arabian desert and Sahara are very rich in deposits of mineral oil. The great Australian desert has deposits of gold and the gold fields of this region have been responsible for the colonization of the whole island. The towns of Calgoorli and Coolgardie have grown only because of the gold deposits there.

Human Life—The people live in tents if they are wanderers or robbers. The settled population lives in houses made of stone-walls having flat roofs. History tells us that due to the vast expanse of sandy waste surrounding people of this region and due to the fact they have always to look at the stars in the sky, we find that the desert areas of the world have produced great astronomers and mathematicians. The people generally have a philosophical outlook because of these factors.

Tropical Grassland Region

This type of climate is found on both the sides of the equatorial belt and is also known as the "Sudan type", or Savana type. It has less precipitation and there is a distinctly dry and wet season. Accordingly in these regions tall and dense forests are replaced by tall grass interspersed with trees.

The regions of this climate occupy a transition belt between the desert climates on one side and the rain-forest climate on the other. Roughly it extends between the latitudes of 5 and 15 degrees latitudes around the equatorial belt. The characteristic regions of this climate are the Lanos of the Orinoco valley in Venezuela and Columbia, the Compos of Brazil, the Sudan and Veldt of Africa and the tropical grassland of North Australia. Being intermediate in location, these regions have got transitional characteristics in respect of wind, temperature, rainfall and natural vegetation.

Temperature and Seasons—These regions also have sufficiently high temperature although in the wetter southern belt, the temperature is a little low while in the drier northern strip, the temperature is a bit higher. The yearly range of temperature is about 15°F.

The amount of annual rainfall is between 70 to 80 inches on the forest side while it is only 10 to 15 inches on the desert side. The rain falls during the spring and summer months, the winter months remain absolutely dry.

Natural Vegetation and Animals—The natural vegetation is tall grass with scattered trees. Very often the grass is as high as 10 ft. and because of its coarseness and thickness, the whole area presents a great difficulty and impenetrability. The thick and tough stems of the grass lie matted on the ground. Here and there lie scattered trees which are more on the equatorial side. Due to strong winds prevalent here, the trees are umbrella shaped so that their least edge is exposed to the wind. The grass of this region is green during the rainy spring but the intense heat of the later months scorches it, making the country dry and brown.

The animals that haunt this region are generally of two kinds—(1) the grass eating antelopes and giraffe which run swiftly and (2) the flesh eating tigers and leopards that prey upon the former.

People and Industrial development—The natural occupation of the people is cattle rearing. On the desert margins people tend to lead a nomadic life while on the equator rain-forest margins, because of heavy rainfall maize, millets, cotton sugarcane and tropical fruits are grown. On the whole, these regions still remain undeveloped.

Commercial Development—Except for those regions where water is available and, therefore, agriculture is possible or where the exploitation of minerals has brought about commercial development, all other desert areas are simply huge waste lands and act as obstacles to human intercourse. The mining centers of Australia, Chile, South Africa and Arabia are quite developed but all others remain a wide expanse of sand and rock waste where even the angels fear to tread.

5. WARM TEMPERATE REGIONS

As we move out from the tropical regions and go towards the poles, we find that the temperatures get lower and the rainfall gets scantier. Areas in the temperate regions which lie towards the side of the Equator are warmer than those which lie on the side of the poles. The warm temperate regions are those which are contiguous with the tropical areas and they consist of one type of climate on the western coast while another type of climate on the eastern coast. The warm temperate west margin regions have the Mediterranean type of climate while the warm temperate eastern coasts have the China type of climate. As we move from the coasts to the interior, we find variation of climate and this variation is different in the interior lowland regions from what it is in the interior highland regions. Turan in central Asia is an example of the first type, while Iran or Persia is the example of the second. As such, the warm temperate regions consist of Mediterranean type of climate, China type of climate, Turan type of climate and Iran type of climate.

Mediterranean Regions

Situation and Extent—The Mediterranean type of climate is found on the side of the land masses between 30° and 40° latitudes both to the north and south of the Equator. The areas surrounding the Mediterranean sea are the most important and characteristic areas of this type. Northern portion of California in North America, extreme south-west area of south Africa, central portion of Chile in South America and the south-east, and south-west corners of Australia are other areas which enjoy this type of climate.

Climate—This region comes under the influence of trade winds during the summer. Because these trade winds blow from the land to the sea, they do not receive any rainfall. Summers are absolutely dry. In winter, westerlies blow over this area and as these winds are coming from the sea, they bring rain. The summers are, therefore, warm and dry while winters are wet and mild. The most important factors of the climate are sunny cloudless skies over a large period of the year and small seasonal change of temperature. The average annual rainfall is about 35 inches and the temperature ranges from 50°F. in winter to 70°F. in summer.

Natural Vegetation—The natural vegetation in these regions is according to the available moisture supply. Where the rainfall is more than 40 inches, forests of cork-oak, chestnut, walnut, etc. are found. But, where the rainfall is less than 40 inches, the

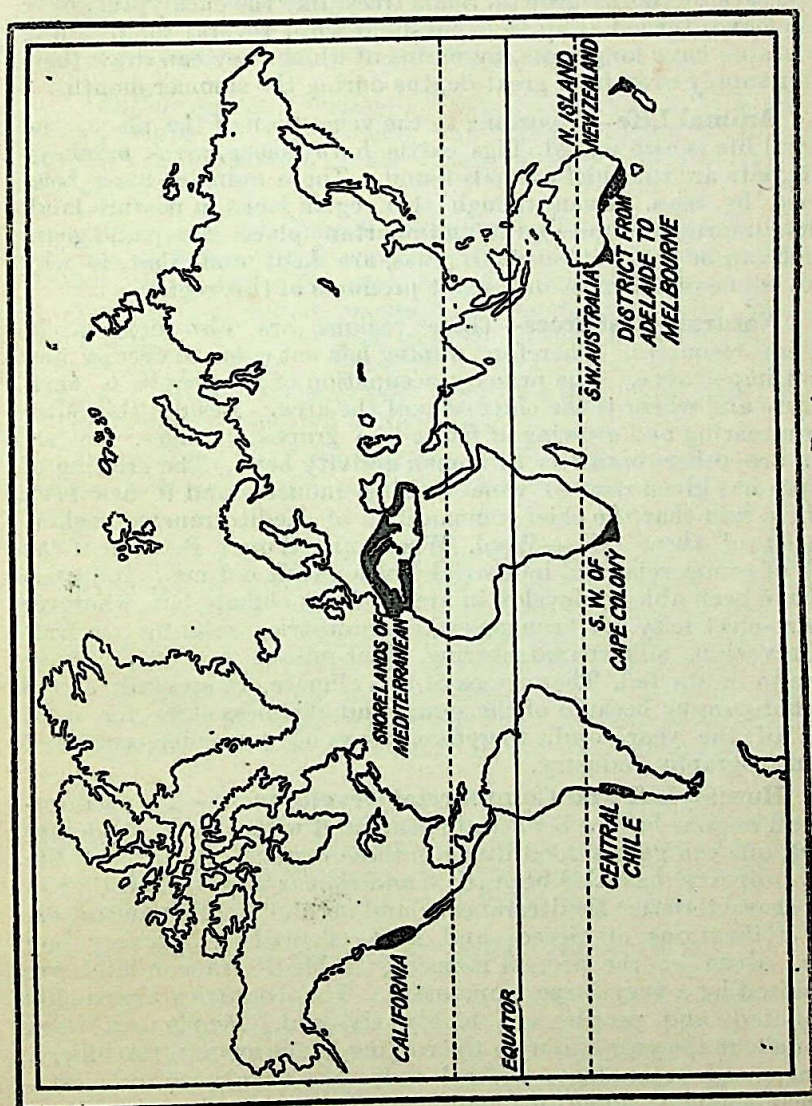


Fig. 16—Mediterranean Regions.

natural vegetation consists of ever-green trees and shrubs. According to the environment, we find such types of plants and trees growing in this region as :—

- (a) only grow in winter ;
- (b) are able to stand shortage of water in summer and ;

(c) have protective devices inherited from nature. These protective devices consist of small leathery leaves or leaves with coating of wax as we find in the case of oranges. Some have tiny leaves covered with fine silky hair as in the olive and some have thick bark or thorny growth. Some trees, like the eucalyptus, have their leaves turned away from sun-light while several plants, like the grapes have long roots, by means of which they can draw their water supply even from great depths during the summer months.

Animal Life—According to the vegetation of the place, the animal life is also varied. Pigs, cattle, horny sheep, asses, monkeys and goats are the chief animals found. These animals have been tamed by man. Even though this region lacks in pasture land, animal rearing occupies quite an important place. Sheep and goats which can be fed even on small grass, are kept and that is why wool is one of the most important products of this region.

Natural Resources—These regions are also deficient in mineral resources. Therefore, mining has not come to occupy any great importance. The primary occupation of the people is agriculture and wheat is the chief crop of the area. Besides this, silk-worm rearing and growing of fruits like grapes, oranges, lemons, etc. are other branches of human activity here. The growing of grapes has given rise to wine making industry and it has been rightly said that the chief commodities of Mediterranean regions consist of three 'W's—Wool, Wheat and Wine. Because of the lack of commercial and industrial development not many industries have been able to develop in areas of this climate but wherever Hydro-electricity has been generated, industries relating to fruit preservation, silk manufacturing, flour-milling and baking have come to be started. The regions of this climate are specially suited to photography because of the sunny and cloudless skies for most part of the year, and, therefore, they have become centres of cinematography industry.

Human Life and Commercial Development—The Mediterranean regions have a bountiful nature and with a very moderate effort, one can gain a good living in these regions. Security of life and property has also been there and that is why we find that in the characteristic Mediterranean land around Mediterranean sea, the civilizations of Greece and Rome flourished for a very long time. Even at the present moment, the Mediterranean lands are inhabited by a very large population. The countries are thickly populated and people are highly civilized. People can work throughout the year and with the coming of the modern machinery, science and technology, several industries have come to be established, the most important manufacturing industries being soap-making, silk-goods manufacturing, canning and drying of fruits and manufacture of textiles.

Mediterranean and Monsoon Regions Compared—This climate often tends to compare very well with regions of Monsoon climate in the tropical areas.

Difference of Climate—The monsoon type of climate prevails in those areas where heat of the summer is followed by rainfall and the rainy season is the time for preparing field. The winters are dry and cool. As against these characteristics, the Mediterranean regions have dry and hot summers and cool and wet winters. While the monsoon regions have three seasons of the year, Mediterranean lands have only two seasons.

Difference in Situation—While the monsoon type of climate prevails in the tropics, Mediterranean type of climate is found in areas situated on the western margin of the continents in the sub-tropics.

Difference in Natural Vegetation—The natural vegetation of the monsoon areas consists of sal, tea, coconuts, banana, rubber, etc., while the trees found in the Mediterranean type of climate are oak, walnut, eucalyptus, chestnut and olive but both these regions have deciduous trees which shed their leaves during the period of dryness. However, we do not find in the monsoon regions the mediterranean type of vegetation with thick leaves, long roots or wax-coated leaves, etc.

Similarity of Occupation—Both these climatic regions have thick population and the main occupation of the people is agriculture.

Difference in Agriculture and Other Produce—The monsoon areas generally grow rice, millets, oil-seeds, pulses, jute sugar-cane, cotton and wheat in only certain special areas. The Mediterranean type of climate is famous for wheat, grapes, olive, mulberry and citrus fruits. Monsoon regions are, however, very much richer in minerals than the Mediterranean regions and that is why we find the monsoon regions have developed various types of industries which we do not find in the Mediterranean lands of the world.

Similarity in being Centres of Civilization—Both the Mediterranean and Monsoon regions of the world have been the seats of ancient civilizations and from a very ancient time in the past they have been seats of world trade and commerce.

Warm Temperate Oceanic or China Type Regions

The Mediterranean climate is found on the western side of the continents between 30° and 40° latitudes on both sides of the equator. On the eastern side of the continents within the same latitude—or more exactly between the latitudes of 25° and 40° is found a climate which has got the following three characteristics :

(a) It is also a transitional belt between the low and the middle latitudes. (b) These regions have more abundant rainfall. (c) The rainfall is well distributed throughout the year or comes mainly during the summer season. (d) The regions of this climate

are more marked in the northern hemisphere than in the southern.

Its characteristic regions are the south-eastern States and Florida in the U.S.A.; the greater part of China in Asia; the south-eastern coastlands of Australia and south Africa and the region of Uruguay and south eastern Brazil in South America. The different regions have almost similar climatic conditions but the major physical features produce local differences.

According to individual characteristics and local conditions, the regions of this climate can be divided into three sub-types :

(a) The south-eastern states of the U.S.A. have the *Gulf type* or the *Cotton-belt type*. These regions receive their rainfall from the moisture-laden winds of the Gulf of Mexico and the north-eastern trades. The rainfall is throughout the year although more in summer months. The 20 inches rainfall isohyet forms its limit in the west while the January isotherm of 40° F, sets its boundary in the north.

(b) The central and northern portions of China have the *China type*. The general climatic conditions are the same as in the monsoon lands, the only variation being lower temperatures during summer months.

(c) The regions of this climate in the southern hemisphere have the *Eastralian type*. The normal trade winds bring rain to this region all the year round but mostly in the summer months.

Temperature and Seasons—These regions are washed by warm ocean currents and hence no cool marine influence is seen on the coastal areas. Between the temperatures found on the equatorward margins and the poleward margins there is usually a difference of 40° F. The frost is common throughout the year but on the equatorward margins, it is only common in the winter months. The daily range of temperature is moderate-between 13° to 150°F. During the summer months the average temperature ranges from 75° to 80°. There are times when the temperature may exceed 90° F. The relative humidity is also quite high-90%. Because of high humidity and high temperatures the weather is sultry and oppressive both during the day and night.

Winters are mild and average temperature ranges between 40° and 55° F. January is the coldest month in the northern hemisphere while July is the coldest month in the south. Due to larger ocean areas in the south, the winter in the regions of the southern hemisphere is milder. On the other hand the northern hemisphere has colder winters and also a larger range of temperature. The humidity is quite high, 70% to 80% and the result is that the weather of winter months is chilly and uncomfortable.

Rainfall and Winds—The rainfall is quite abundant and well distributed throughout the year although local differences in the amount of precipitation is seen in different areas. The chief

characteristic is that there is no period of distinct drought although it is more in summer and less during winter months. Depending upon location and configuration of land, the annual rainfall averages from 30 inches to 60 inches.

The summer rain comes from convectional storms which are accompanied with thunder and lightning. These storms are most developed in the region of the U.S.A. Besides, quite a considerable amount of rain is also received from weak cyclonic storms and tropical hurricanes, the latter precipitating in late summers and early autumns. The summer rain is in heavy downpours and the autumn is the least rainy season. The usual storms that visit these lands during summer months are the hurricanes and the typhoons on the coastal areas while in the interior local storm-winds prevail. In the U.S.A. such winds are called 'Northerers' in the winter and the new South Wales area of Australia is frequented by the 'Southerly buster's'.

The winter rain is mainly cyclonic in origin and that is why the winter skies are cloudier than the summer. Sometimes snow also falls but it soon melts. Snowfall is more on the poleward margins as general rainfall is more on the seaward borders. The winter rain is in the form of drizzles.

Natural Vegetation and Animals—The differences of climate influence to bring about a wide variety of plant life. Where the rainfall is sufficiently well distributed, evergreen forests are the rule. These forests are quite luxuriant in their growth but quite open and magnolia, palm etc., are the characteristic trees. Towards the poleward margins occur the deciduous forests which shed their leaves during winters; oak, poplar, willow and gums being the chief varieties found. But at many places these forests have been cleared and ground utilised for crop farming.

The native animals of many regions have been destroyed or displaced by man's occupation. Still squirrels, rabbits, racoon, porcupine and several varieties of birds are quite common. Domestic animals are kept in the Pampas of Argentina and the central part of Florida where cattle ranching is carried on.

People and Industrial Development—The soils of these regions are poor due to continued use and leaching but wherever rivers have swollen waters, their floods renew the fertility. The temperature and widespread rainfall also favour plant production with the result that agriculture is the main occupation of the people. A wide variety of crops are grown. In the South-eastern States of North America cotton, sugar, rice and tobacco are important. In China tea, mulberry (for silk worms) and cereals are more important. In the regions of this climate in the southern hemisphere, grazing of animals is combined with the production of cereal crops. In Brazil coffee is also grown. In North America and Australia corn is also grown, throughout the summer and in

Florida, citrus fruit production forms a very important part of the local economy. Along with horticulture, vegetable cropping is also important in Florida.

Cotton is the cash crop of North American region while mulberry (raw silk) is the cash of these regions in the east-China and Japan. The regions of this climate and their form of agriculture require hard labour. This problem was solved in Australia, China and Japan by local population but it took unduly large proportion in North and South American regions where the European settlers solved it by importing Negro labour and by introducing the system of slavery at the outset.

Warm Temperate Interior Highland or Iran Type Region

The **Iran Type** which are initially *temperate deserts*, includes the basins surrounded by mountains and the typical examples are those of Gobi, Shamo, Iran and Turkestan in Asia and the Great Basin in the United States.

Temperature and Rainfall—Being situated in the heart of the continents, they generally have wide ranges of temperature, both diurnal and seasonal. Summers are warm but winters are comparatively cold although the actual temperature differs from region to region according to its location and latitudinal expanse.

The precipitation is scanty and a portion of it is received in the form of snow. The total annual rainfall is seldom more than 10" and falls generally in the summer months. But in those regions which flank the Mediterranean regions the rain may fall due to cyclones in the months of the winter season.

Natural Vegetation and Animals—Some temperate deserts are poor grassland, while in some the thorny bushes and shrubs predominate. On the whole the vegetation is not such as can support any animals except a few sheep and goats in the more favoured regions.

People and Industrial Development—Due to their situation, inaccessibility, extreme climate and scanty rainfall, these regions have been called "Regions of lasting difficulty". The soil is good and fertile but agriculture can only be practised where water can be found. In the United States of America, irrigation facilities have been developed quite extensively and crops like alfalfa grass, potatoes and sugarbeet are grown. Certain fruits are also grown. But in certain other basins or bolsons, the internal drainage tends to make the regions alkaline and infertile. This is why they are the least developed and economically the most backward regions of the world.

Certain regions are or have developed because of the availability of certain minerals. Bolivia is important for its tin and

copper deposits. Except in such regions, the temperate deserts are thinly populated and hold no place what-so-ever in the economic map of the world.

Warm Temperate Interior Lowland Region or Turan Type

Situation, Extent and Climate—In the warm temperate belt as we move away from the coast into the interior of the continent, we find the lowlands having extreme climatic conditions. The central Asian lowland, known as Turan basin is the most characteristic and after it, this region is often called the Turan type of climate. Other areas of this type of climate are found between 100° West latitude and the rocky mountains of the U.S.A., in Murray-Darling basin in Australia and the lands to the east of the Parana river in South America. Winters are very cold and dry summers are hot and rainy, but the rainfall is not very much. Extremes of temperature are the normal rule, the annual range being 60°F and the average annual rainfall is only about 2 inches.

Natural Vegetation and Economic Activity—As a result of very poor rainfall, trees cannot grow and, therefore, natural vegetation is poor grassland. Wherever greater amount of water is available, agriculture is carried on and maize, cotton, wheat and barley are grown. In America and Australia, these regions are utilised as great pasture-lands whereas in the wetter parts, cattle and in the drier parts sheep are reared. Wool, meat, hides and skins are the important produce. Thus, we see that in areas of this type of climate man can either grow wheat or rear sheep which yield wool. As wheat has to compete with its variety in the lands where facilities of irrigation have been provided, mostly people prefer sheep-rearing. In the areas of this climate, in Asia and North America, wheat is no doubt grown extensively but in South America and Australia, sheep-rearing is most important. Except for the U.S.A. where this region is rich in petroleum, silver and gold, these regions are deficient in mineral resources and, therefore, their economy depends only on wheat or wool.

Until very recently these areas were inhabited by nomad tribes which moved from place to place with their flocks of animals but now settlements are growing on the ranches or the extensive mechanized wheat farms.

6. COOL TEMPERATE REGIONS

Between 45° and 60° latitudes, both on the north and south of the Equator, on the western side of the continents are found regions which are under the influence of west winds and the ocean currents. On the western coasts, regions of cool temperate oceanic climate are found, while on the eastern margins within the same latitude are found regions where the rainfall is less and the winters

are much colder. These are known as St. Lawrence type of climate. As we move from the coastal regions towards the inside of the continents within the same latitudes, we find the interior regions which have grasslands where the rainfall is sufficient and the deserts where the rainfall is poor.

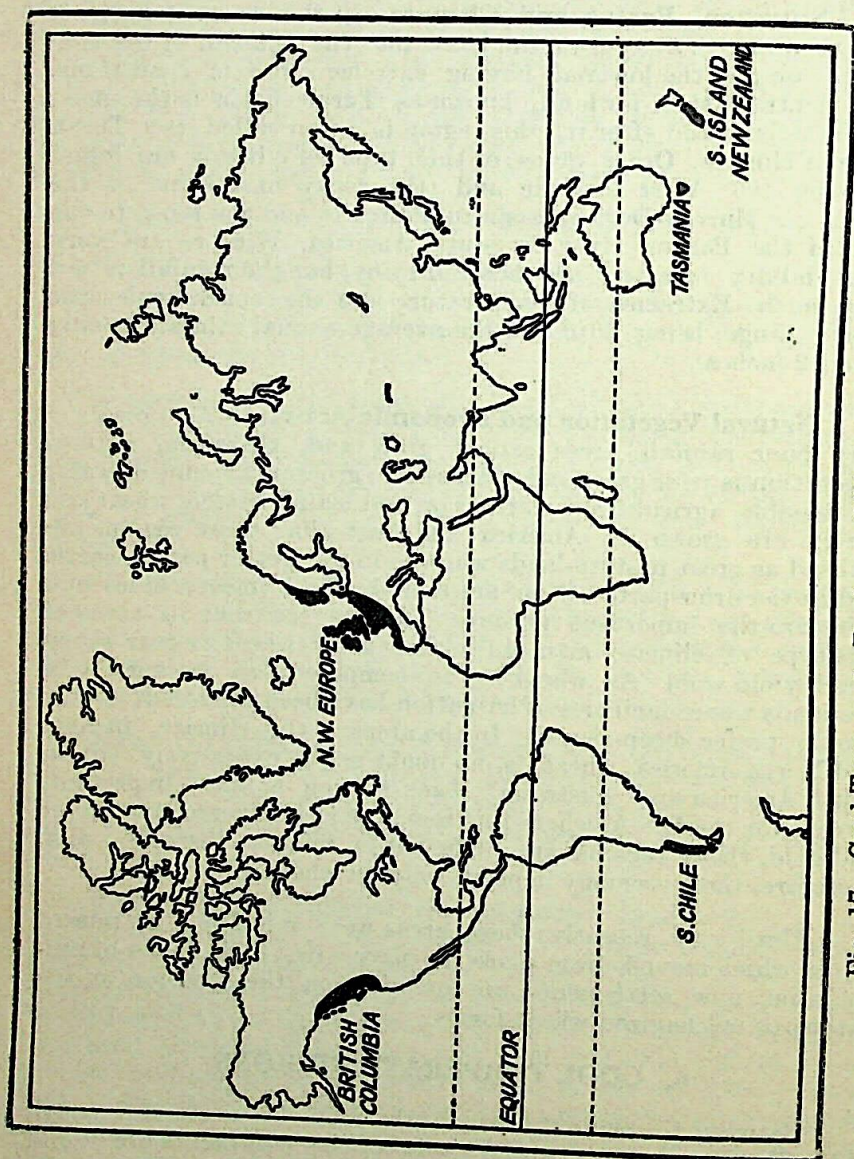


Fig. 17—Cool Temperate Regions of West European Type.

Cool Temperate Oceanic or West European Type Regions

Situation and Extent—The cool temperate oceanic region which is also known as the West European type of climate consists

of British Islands, Northern France, Belgium, Holland, Germany, Denmark, Poland in Europe; British Columbia in Canada ; South Chile in South America and New Zealand and Tasmania.

Climate—These regions are under the influence of west winds throughout the year. Cyclones and anti-cyclones blow in succession and the average annual rainfall is about 50 to 70 inches. The area is also influenced by the sea. The winters are less cool and the summers are less warm. The three characteristics of this type of climate are :—

1. A small range of temperature.
2. Well-distributed rainfall throughout the year.
3. Uncertainty of weather.

Sometimes, there are mists and fogs while at other times, the sky remains clear and bright. Warm and cool ocean currents usually meet along the shores of these regions and bring about a effect on the climate.

Natural Resources—Once upon a time, these regions of the world were under the great ice-sheet which has since melted but it has left its deposits in the coastal areas, where the shallow water areas have been formed. These shallow water areas or continental shelf are very important from the point of view of fishing. The land has been the home of temperate deciduous forests which had such important trees, as oak, maple, elm and poplar. In most of the areas, these forests have now been cleared, because as population increased more and more area had to be brought under the plough or made available for settlement. The rainy, cloudy, cool weather and moist soil is good for the growing of crops but does not favour ripening. In the sheltered areas, wheat, rye, oats, potatoes, sugarbeet, barley and fruits are grown. In the coastal areas, fishing is an important occupation of the people and almost every country in the north-western Europe has a large catch of fish which is used both for food as well as export. This region is particularly rich in minerals and extensive deposit of coal and iron are found very often and also close to each other. British Columbia and New Zealand are also rich in gold.

Commercial Development—The presence of minerals combined with the most suitable climatic conditions for human activity have led to rapid and extensive industrialization. These regions have industries of various types and at the present moment, they have come to dominate the world not only in trade and commerce but also in the advancement of science and technology. Mixed farming in which cattle, pigs and poultry are kept along with crop-farming, fishing, manufacturing industries and trade and commerce are the chief economic activities of man here. Iron and steel works, textile, engineering and ship-building industries are highly developed in north-western Europe. In Scandinavia, British

Columbia and New Zealand, lands are still uncleared and therefore, the occupations of men are logging and lumbering ; dairy farming ; fruit growing and processing of fish caught from the seas.

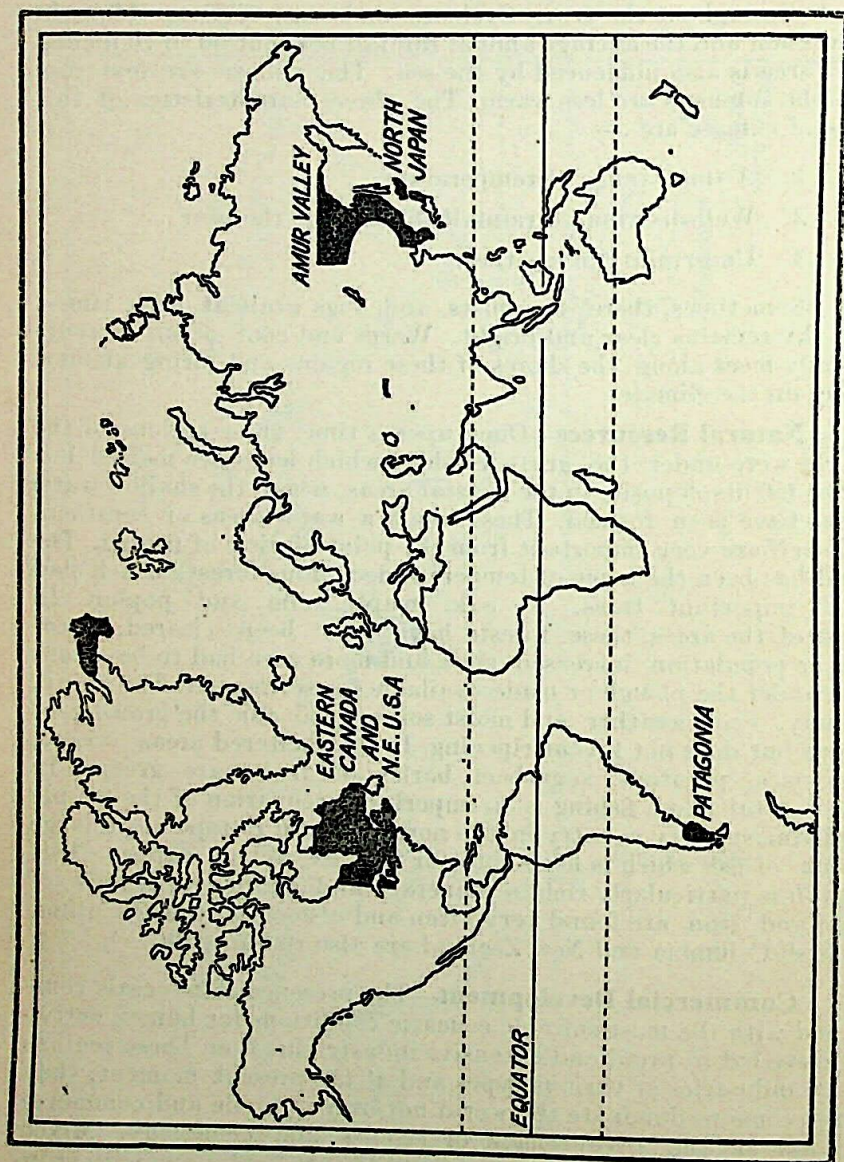


Fig. 18—Cool Temperature Regions of St. Lawrence type.

On the whole, these regions are thickly populated and may be called the manufacturing regions of the world. The standard of living of the people is fairly high and the people import food-stuffs in exchange for their manufactured goods.

The St. Lawrence Type of Regions

Situation, Extent and Climate—On the eastern margins of the continents within the same latitudes, we find regions which have somewhat modified conditions. Eastern Canada, north-eastern U.S.A. in North America ; Manchuria and Northern part of Japan in Asia and Patagonia in South America are the main areas of this type. The rainfall is lesser in quantity and the region is often visited by thunderstorms. The winters are colder and the summers are slightly warmer so that the range of temperature is higher than that of the regions of west European type. There is a snowfall in winters and water currents are very important in influencing the climate and life of these regions.

Natural Resources—Normally, forests occur in this region. In these forests, soft-wood coniferous trees are found freely mixed with broad-leaved hard-wood deciduous trees. Wherever land has been cleared, pastoral and agricultural activities are carried on. Oats, barley and potatoes are the chief crops. Horticulture is a very important activity in the sheltered areas of eastern Canada, other-wise almost everywhere mixed farming and dairying are the rule. Minerals like gold, silver, copper and petroleum also occur.

Commercial Development—The chief occupations are lumbering, farming, mining, manufacturing and commerce. Several modern industries have been set up with the help of hydro-electricity and almost all regions of this climate are now commercially and industrially developed as regions of West European type of climate. Northern Manchuria and Patagonia are the only two regions which have not been able to develop so much because of the lack of transport facilities, distance from the world markets and unsettled political conditions. But there also, the turn has taken for the better and a hope of greater development in future is held out.

Cool Temperate Interior Grassland or Prairie Regions

Situation and Extent—Within the latitudes of 45° and 60° as we move from the east or the west we reach the interiors of the great land masses. These areas are very far removed from the seas and, therefore, they have high temperature in summer, very low temperature in winter and a very poor rainfall. The different areas of this region are called by various names in different continents of the world. The interior lowlands of Canada and the U.S.A. are called *Prairies*. The area extending from Central Europe to Siberia is known as the *Steppes*. In South America, areas of this climate are known as *Pampas*. In South Africa, they are known as the *Veldt* and in Australia, they are called by the name of *Downs*.

Climate—Although these regions are under the influence of west winds all the year round because they are far away from the sea, the amount of rainfall is less. The rainfall is more in

summer and less in winter. The summer temperatures are higher while the winter temperatures are lower than other regions of the cool temperate type. But it is not unpleasant in summer. We may say that the summers are short and warm, while winters are cold and dry. Some snow also falls during the winter season.

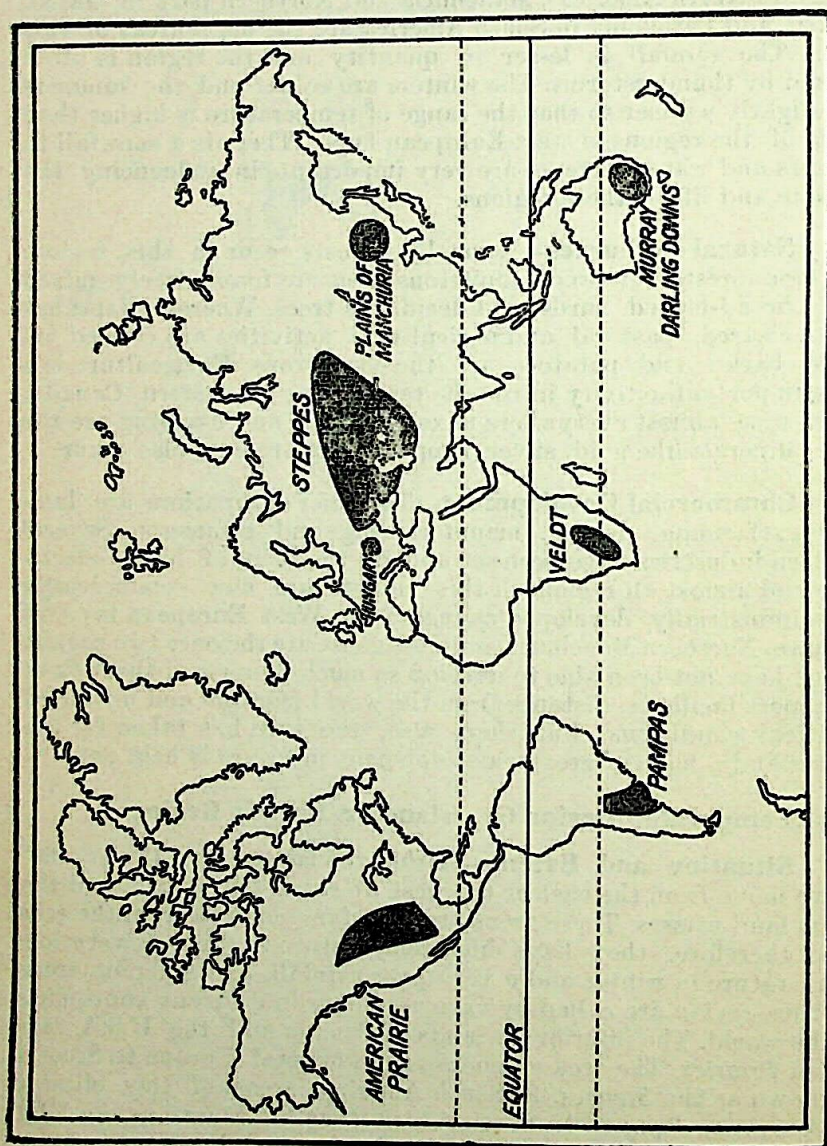


Fig. 19—Temperate Grasslands.

The little rainfall that falls in the spring and summer months is insufficient for the growth of trees. Therefore, the natural vegetation is grass but this grass is not as coarse or as thick as that found in tropical grasslands. The temperate grasslands are treeless

regions and for miles and miles there is nothing but plain grass growing. The animals found are such as migrate from place to place and gather together for the sake of food. They can run fast and eat grass.

Human life and economic activity—Till only a few decades back these regions were absolutely barren but men began to settle there and their chief activities became rearing of animals or agriculture. The first inhabitants of this region were wild-hunters, but later on they took to herding of sheep, goats and cattle so that pastoral farming became of great importance. In South Africa, Australia and Argentina, sheep-farming is the most important activity still and most of the wool that we get comes from these regions. Gradually man turned his attention to agriculture and now these regions are very important agricultural areas of the world, wheat being the most important single crop. Because of extensive mechanized agriculture, the temperate grassland have become the granaries of the world from which most of the industrialized countries of the world get their food-stuffs. The *prairies* of Canada and the U.S.A. produce and export wheat, reat cattle for meat and have also developed dairy farming. In the *pampas* of Argentina, on the one hand wheat, barley, rye and oats are grown for export and on the other, cattle and sheep are reared and live animals are exported. Dairy-farming has not been able to develop very much. The *Veldts* of South Africa grow wheat, sugar-beet and barley for local requirements but sheep rearing is the more important occupation. The *Downs* of Australia grow wheat, barley and sugar-beet and some part of it is also exported but the most developed occupation is sheep rearing in dry areas and cattle rearing in wetter portions. Wool and mutton besides other dairy products, are the most important things of export. The *Steppes* region of the U.S.S.R. was at one time absolutely barren and backward but now it has become the major wheat growing region of the Soviet Union. Sugar-beet oats and barley are also grown. Flour-milling and sugar-manufacture are important manufacturing industries but gradually more and more industrial activity is to be seen.

7. COLD TEMPERATE REGIONS

These are found as a continous belt in North America and Eurasia and coincides with the regions of subarctic climate. This is most developed in the northern hemisphere only where the land masses predominate and broaden out towards the pole.

The chief characteristic of these regions is a long cold winter when the ground is frozen and short summers when the thawing of the winter snow produces muddy swamps.

Temperature—The average temperature is about 40° F although in certain regions the average gets below freezing point. The average temperature for the hottest month is 70° F. The short summer season has daylight lasting from 18 to 24 hours. On

the other hand the long winter season has a greater length of darkness. Hence the growing season is seldom more than two to four months. Even this season is very cool, short and precarious. The change from summer to winter and vice versa is so abrupt that there are very short spring and autumn seasons.

Rainfall—The rainfall is meagre and except coastal lands or the southern margins, the rainfall is seldom more than 20 inches per annum. This low rainfall is due to low temperature, low absolute humidity, anti-cyclonic conditions and preponderance of land mass. Much of the rain comes in the form of snow.

The long winters are usually dry, most of the rain being concentrated in the warmer months. But in the absence of effective evaporation, this meagre amount is enough for plant growth. Besides, thunderstorms also occur quite occasionally and sometimes heat waves are also experienced.

Natural Vegetation and Animals—Nature has provided against excessive cold by making the leaves of these trees thick, resinous and needle-shaped. The majority of the trees—spruce, fir and larch are evergreen although along river banks and in deep valleys are found the clumps of deciduous trees as birches, willows and poplars. These forests are interspersed with mosses and lichens in the darker places and pass into low shrubs towards their poleward margins.

People and Industrial Development—The main occupation of the people here is forestry and hunting. Wherever access has been convenient, forest resources have been exploited and lumbering is the main occupation. Snow cover in winter and swollen rivers during summer provide very good transport way for the hewn logs of soft timber.

In the northern part of these regions lumbering is not practised because (1) the trees are too small, (2) the growth is poor in quality, (3) the forests are badly burnt out, and (4) the areas are difficult to reach and get out. In Siberia, the trees grow in patches widely separated by bogs, marshes and muskegs. Hence lumbering is not economical. Thus Canada and North Western Europe remain the most important in this respect and the presence of hydro-electricity has led to the development of sawing, milling and paper pulp manufacture.

In the unexploited forest areas, people are busy hunting and trapping the fur-bearing animals and these regions have supplied the raw furs of the world. But gradually the fur resources of these regions are getting depleted. Therefore, the fur-yielding animals are now domesticated and fur farming is carried on.

8. POLAR REGIONS

Polar Lowland Region or Tundra

Climate—During winter months the temperatures are so low that most of the ground is covered by snow, as deep as

fifty feet. During summer the temperatures are quite warm except on highlands and snowfields. The warmth of winter thaws the snow cover to the depth of two or three feet. The average temperature ranges from 40° to 50° F. the warmest months being June, July and August. Sometimes the summers become uncomfortably warm and the sun is above the horizon for about 20 hours of the day. In Alaska the temperature often goes as high as 100°F. The annual range of temperature is quite large.

The average rainfall ranges from 5 to 15 inches, being more on the coastal regions. Fogs and clouds make the weather quite dull. Most of the precipitation comes in the form of snow.

Natural Vegetation—Tree growth is not possible but some form of grass, stunted shrubs, lichen and mosses grow.

The Tundra type of vegetation varies in its growth according to the amount of moisture and the nature of the soil. The season of growth is the summer when the snow melts. This vegetation is able to support a few reindeer.

Animals—The chief animals that live on land in American Tundra are the musk ox, the fox, the caribou, the wolf, the hare, the lemming. Dog is the domestic animal of this area. In the Tundra region of Eurasia—known as lapland the inhabitants have been able to domesticate the reindeer as well. The musk ox and the polar bear are also found. On the southern margins of the Tundra and lapland regions are found the fur-bearing animals like the beaver, the otter, the lynx and the sable.

People and Occupation—Agriculture being impossible, the main occupation of the people here is hunting and fishing. The animals yield to them meat for food, skin for clothes and shelter, fat for brining and lighting. They catch whales and walruses, the latter especially for its ivory tusks.

The permanent population is very scanty, only 5,000 in a million square miles of Canadian Tundra. The average is one family for each thousand miles. The laplands of Eurasia are more populated, the average density being one person for every square mile.

There are two groups of people living in these regions : the Eskimos in America and the Lapps in Eurasia. The eskimos are coastal people and depend upon hunting, chiefly in the sea. Their life is generally nomadic and they live in tents or long huts during summer while during winter months they make for themselves snow houses. During summers they hunt from their Kayak while in winters they hunt with spears thrust through ice holes.

The Lapps are much better off and their way of life is semi-nomadic. The basis of their economy is the domesticated reindeer.

Polar Highland Region or Greenland Type

In the northern hemisphere the interior of Greenland and many other islands of Arctic ocean have the ice-cap while in the southern hemisphere the whole of Antarctic except the coastal margins forms an ice-cap. These are centres of continental glaciers and are perpetually under snow cover. Not much information is available about them.

Climate—The climate of these regions is characterised by the lowest temperatures—22° to 25°F. The temperatures for the hottest month remain below the freezing point. Another characteristic of these regions is the prevalence of the violent storm winds, known as Blizzards, which blow at the rate of 100 miles per hour. They carry the snow through the air and cause poor visibility.

Vegetation and Animals—These regions are completely devoid of plant life of any kind. During the summer, lichens and snow algae crop up. But there is comparatively more plant life on the sea, where certain types of sea weeds grow.

There is no animal life except some fish in the surrounding oceans. Cod is the chief type of fish found in abundance in these regions. Besides, there are many types of birds like penguins and sea-gulls, which feed on birds. In the open seas walrus, seals and whales are also found.

People from northern continents visit these regions for catching and hunting these sea animals. Walrus yields skin, ivory, tusk and oil ; the seal and the whale yield skin, meat and oil.

Agriculture—Types, Factors, Limits

1. IMPORTANCE OF AGRICULTURE

Agriculture is concerned with the growing of crops or of rearing of cattle (animal husbandry). Broadly, agriculture production consists of two types of goods viz., (a) foodstuffs such as rice, wheat and other cereals and pulses, fruits and beverages, meat, butter, and other dairy produce ; and (b) industrial raw materials, such as cotton, jute, oilseeds, hides and skins, wool, rubber, etc. In some regions, farmers specialise in one or the other of these products but more commonly, they adopt mixed farming and produce both foodstuffs and industrial raw materials.

Agriculture is the most important occupation in the world as a whole and in a developing country like India it forms the backbone of the economy. Something like 75 per cent of the world's population are engaged in agriculture, either in the growing of crops or in the rearing of animals. An idea of the proportion of working population engaged in agriculture can be got from the following table :

Table IV : 1—Per cent of Working Population Engaged on Land

<i>Country</i>	<i>Per cent</i>
India	70
Egypt	65
Malaya	64
Brazil	58

In the Indian economy, with agriculture as the dominant activity, the main source of livelihood is agriculture itself. Seven of every ten persons in India depend upon agriculture. This proportion is indeed very high and what is remarkable is that between 1901 and 1961, it has remained almost constant, inspite of tremendous effort at industrialisation. But in an industrially advanced country like United Kingdom, only 5 per cent of the working population is engaged in agriculture ; in U.S.A. the proportion is about 12 per cent and in Australia, it is about 16 per cent.

That agriculture constitutes a very important occupation in a country can also be seen from its share in national income. According to 1968-69 figures, the share of agriculture in national income in India was 44.4 per cent ; at one time the share of agriculture in national income was of the order of 65 per cent (before the first world war) and 57 per cent during 1925-29. Even in predominantly industrial countries like U.K., U.S.A. and Belgium, agriculture is a major and important activity. In countries where conditions are far from good for agriculture such as Norway, agriculture is the single most important activity. Of course, the more developed a country, the smaller is the share of agriculture in national income.

Agriculture is important for industrial development too. The significance of Indian agriculture arises from the fact that it has been the source of supply of raw materials to our leading industries. Cotton, jute, sugar, vanaspati, tobacco and many other industries depend upon agriculture directly. There are many other industries which depend upon agriculture in an indirect manner. Many small-scale and cottage industries in India like handloom weaving, oil crushing, rice husking, etc., depend upon agriculture for their raw materials. Agriculture is thus significant as a source of raw materials for many traditional manufacturing industries.

In the field of international trade too, agriculture is quite significant. A high proportion of international trade is in agricultural goods—foodgrains, cotton, jute, coffee, tea, oilseeds, tobacco, spices, etc. About 50 per cent of India's exports consists of agricultural goods.

Importance of agriculture in the national economy is also indicated by many other facts. For example, agriculture is the main support of India's transport system since railways and roadways secure bulk of their business from the movement of agricultural goods. Internal trade is mostly in agricultural products. Further, good crops involve larger purchasing power with the farmers and therefore, lead to greater demand for manufactures. In other words, in a developing country like India, the prosperity of industries and of the economy as a whole is directly the result of prosperity of agriculture. Likewise, bad crops in a given year will lead to a depression in industries. It is thus clear that agriculture is important for all countries and particularly for developing countries.

2. TYPES OF AGRICULTURE

Agriculture differs from place to place and one will find much more diversity in agriculture than in any other occupation. In some places, there may be specialisation in one or two crops, while in others a wide variety of crops may be grown. Some areas produce crops and dairy produce for local consumption only, while some produce for the national and international markets. In some

countries like India, farms may be tiny and scattered while in U.S.A., U.S.S.R. and Canada the farms may extend over hundreds and even thousands of acres. In some areas, primitive tools and implements are used even now, while in some places, agriculture is highly mechanised, with the latest tractors, harvesters, threshers, etc. In some countries, land is owned by farmers, while in others, some own land but others (tenants) cultivate it ; and in some countries land is held by the state. In some countries, there is intensive cultivation, while in some others, there is extensive cultivation. Thus, there are many different types of agriculture.

Classification of The Types of Agriculture

The different types of agriculture can be classified on the following basis :

- (a) On the basis of cropping pattern,
 - (i) Single cropping;
 - (ii) Double cropping;
 - (iii) multiple cropping.
- (b) On the basis of specialisation :
 - (i) Monoculture;
 - (ii) Interculture;
 - (iii) Mixed farming.
- (c) On the basis of irrigation facilities :
 - (i) Dry farming;
 - (ii) Irrigation farming.
- (d) On the basis of regions :
 - (i) Monsoon agriculture;
 - (ii) Mediterranean agriculture;
 - (iii) Mixed farming in North West Europe;
 - (iv) Tropical plantation agriculture.
- (e) On the basis of method of cultivation :
 - (i) Intensive cultivation;
 - (ii) Extensive cultivation.
- (f) On the basis of the nature of agriculture, the volume of production and the nature of the market :
 - (i) Subsistence cultivation;
 - (ii) Commercial agriculture.

Single, Double and Multiple Cropping

Single-Cropping—In most parts of India, the farmers have been raising only one crop from their land, mainly because of lack of water. Either rainfall is concentrated in two or three months in the year and irrigation facilities are not available for more than one crop to be raised ; or the crop remains on land for the major part of the year, as in the case of sugarcane. Single cropping is responsible for much under-employment in rural areas, under-utilisation of livestock and tools and higher overhead expenses. It is also responsible for the comparative poverty of our farmers.

Double-Cropping—Where rainfall is conveniently spread over the whole year, or where artificial irrigation facilities in the form of wells and canals exist, the farmers are able to raise two crops from the same land. Generally, there is a main crop followed by a subsidiary crop. It is a common practice in most well-irrigated areas in South India to put the land under maize and chillies one after the other. For one thing, the land is continuously utilised and the farmer is able to use his time, tools and livestock to the maximum extent.

Multiple-Cropping—If the farmer is able to raise more than one crop from the same plot of land, one after the other, he is said to adopt multiple cropping. This was not so easy at one time, except probably in the case of vegetable gardening near large cities. But, scientific treatment of the soil, application of hybrid seeds (which mature within a short period) and regular water supply have enabled farmers to raise more than two crops from their land. This system is prevalent in South India, China, Japan, East Pakistan etc.

Mono-Culture, Interculture and Mixed Farming

Mono-culture—Wherever the farmer is able to specialise and concentrate in the production of only one commodity—crop or animal—he is said to adopt mono-culture or single crop culture. In the North American Prairies and the Ukranian Steppes, extensive cereal cultivation is adopted. Fiji, Cuba etc. specialise almost exclusively on sugarcane plantations. The rearing of cattle for beef in the tropical savannas of Brazil or Australia, the growing of coffee in Brazil are some of the other examples of mono-culture. Mono-culture may have the advantages of specialisation and largescale production but it is subject to a number of disadvantages. For instance, a pest or plant disease may create disaster and ruin the farmer. Price fluctuation in the national or international market will bring huge profits or losses and thus will force the farmers to be at the mercy of current world prices.

Inter-culture—involves growing several crops simultaneously on the same piece of land in alternate or mixed rows. It increases the yield of food and maintains fertility, because the various

crops do not consume equal amounts of the same mineral plants foods.

Mixed-Farming—In most parts of the world, farmers do not specialise but adopt mixed farming. That is, they may produce both foodgrains and industrial raw materials. Some they may keep for themselves and some they may dispose off in the market. The advantage of mixed farming is that different plots of land can be put to different uses, depending upon climate and soil conditions. If some crops fail due to natural calamities or due to pests or diseases, the farmer will get some income from others.

Dry Farming and Irrigation Farming

Dry Farming—In those areas where there is little rainfall—less than 20 inches—and where irrigation facilities do not exist, the farmers adopt dry farming. They manage with whatever rainfall they can get and adopt their cultivation accordingly. They may plough the land deeply and repeatedly to absorb as much rain water as possible and they undertake various steps to conserve soil moisture. Dry farming is not so profitable, but nearly 80 per cent of cultivation in the world is of this type.

Irrigation Farming—Water is essential for proper and efficient cultivation. Naturally, man has always attempted to supplement rainfall through artificial irrigation facilities in the form of surface wells, tube-wells, tanks, and canals. Irrigation farming helps the farmers to produce better crops, put their land under double or even multiple cropping.

Sometimes, people speak of *humid farming* when agricultural production is undertaken in those areas where there is plenty of rainfall and where there is no need for artificial irrigation.

Monsoon Agriculture, Mediterranean Agriculture, Etc,

Monsoon Agriculture—Monsoon agriculture is practised in the river valleys of India, Pakistan, Burma, Thailand, Cambodia and China which experience hot monsoonal climate. Cereals, particularly rice, are the major crops. Two or even three crops of rice are raised in the river valleys of these countries, since rice grows well in the hot monsoonal climate and on alluvial soils. Cultivation is essentially for subsistence, though in some areas such as in South India, Burma and Thailand, commercial rice farming is quite common.

Mediterranean Agriculture—This is practised in all those regions around the Mediterranean sea and California in the United States of America. This region experiences hot and rainless summers and moderate winter rains. Mediterranean agriculture consists of cereals, vegetables, fruits and livestock. For instance, North Africa specialises in the production of barley, wine and

olive oil; Greece in raisin, and wine; Italy in wine and California in oranges. Broadly, Mediterranean agriculture consists of winter crops such as cereals and vegetables (with the help of winter seasonal rainfall); summer crops such as rice, vegetables and fruits, wherever irrigation facilities are available; growing of trees such as olives, figs, etc in unirrigated areas; and cattle rearing in the non-cultivated areas.

Mixed Farming—The cool moist summers and comparatively mild winters in the North West Europe have led to a special type of agriculture consisting of winter wheat and raising of sheep and cattle. Root crops, hay and meat animals form the basis of mixed farming in these areas. Rye and potatoes are grown in those areas with severe winter, poor soils and rough topography. As the pastures remain fresh all the year, there is heavy concentration of beef cattle, milk cows and sheep. The distinctive feature of this form of agriculture is the close association of foodgrains and livestock.

Tropical Plantation Agriculture—In selected tropical and sub-tropical areas, plantation agriculture is practised extensively. This system is eminently suited to those crops which require careful handling and processing—such as rubber, tea, sugarcane, etc. This type of agriculture is characterised by large-scale holdings and specialisation in the production of one crop (mono-culture). Plantations commonly require heavy investment of capital and were therefore, originally organised and developed by Europeans; and they rely to a large extent upon cheap labour supplied by the Indians, Chinese and the Africans.

Intensive and Extensive Cultivation

Intensive farming is practised in India, Japan, China, Denmark and other countries where (a) the supply of land is limited, (b) the scope for bringing additional land under cultivation is limited and (c) the density of population is quite high. Intensive methods of cultivation involve absence of fallow land, heavy use of fertilisers, the use of specially selected seeds, carefully planned crop-rotations, specialised and scientific breeding of cattle, etc. In countries like Japan, every patch of land is carefully and intensively cultivated with much labour and/or capital per acre. Two and often three crops of rice are raised every year. Cash crops are sown either between the rows of the main crop or in the short period between two crops. In a country like Denmark, every available plot of land is cultivated and great attention is paid to breeding, feeding and milking of cattle.

Extensive farming is practised in U.S.S.R., U.S.A., Australia, Argentina and Brazil where land is found in abundance. There is not only abundance of land but there is great scope for bringing in additional land too. The object of farming in these areas is not to maximise output per acre but output per man. Vast areas

are cultivated with the aid of machines and mechanical appliances. Extensive farming is large-scale, mechanised and specialises generally in one or two major commercial crops. On the prairies of the U.S.A. and Canada wheat is grown under the extensive system. In the temperate and semi-arid grass lands of Australia, sheep breeding is carried on under the extensive system—in certain parts of Australia, sheep density works out at one sheep per five acres.

Subsistence Agriculture

Where agriculture is carried on mainly to satisfy the food requirement of the farmer himself, we have an example of *subsistence cultivation*. On the other hand, if agriculture consists of raising food crops or industrial raw materials or raising of cattle and dairy products mainly for the market, we have an example of *commercial agriculture*. Subsistence farming may be carried on under (a) primitive conditions in which people are few and utterly backward and transportation facilities are almost non-existent or (b) conditions in which there is heavy density of population and there is scarcity of land for cultivation purposes. In either case, agriculture is essentially used to produce food which enters directly in man's diet and there is no surplus for the market. Subsistence agriculture, which is essentially primitive may, be of three types :

- (a) Migratory Primitive Agriculture.
- (b) Sedentary Primitive Agriculture.
- (c) Subsistence Farming in South East Asia.

Migratory Primitive Agriculture is carried on in the tropical low lands, lying a few degrees north and south of the Equator. It is to be met with in the tropical regions of the Americas, Central Africa, South East Asia and the East Indies. The distinct features of migratory primitive agriculture are :

- (i) Farming is confined to small patches of land within tropical rain forests and on margins of savannas and bush lands.
- (ii) Land is cleared by burning the underbush.
- (iii) The cleared land is used for two to three years only and then abandoned due to decrease of fertility of the soil.
- (iv) Very little manure is used and the tools used are primitive.
- (v) Production is very small and is just sufficient to save the farmer and his family from the pangs of hunger ; there is no surplus over subsistence.
- (vi) Most areas of migratory primitive agriculture have a very sparse population.

Sedentary Primitive Agriculture is practised in plateaus and high land areas in the tropics and is also confined to small and scattered patches of land. Instead of migrating from one area to another farmers become sedentary and permanently settle near ponds, lakes and streams. Valuable raw materials from forests such as rubber and minerals in the low lands have also made farmers settle near the forests and mines. Long rainy seasons followed by short dry seasons favour the growth of crops like maize, sorghum, beans, peanuts, sugarcane, cotton, etc. Primarily influenced by physical conditions, the usual system of primitive agriculture in the tropical rain forest is migratory, whereas that in the tropical plateaus and highlands is sedentary.

Subsistence Agriculture in South East Asia—Most of the agriculture in South East Asia is subsistence in character, even though extensive commercial agriculture has developed in several parts of this area in such crops as tea, rubber, jute, sugar cotton, etc. Millions of small farmers produce major part of rice, wheat, barley, millets, etc in small plots essentially for home consumption. What is left over is sold in nearby towns for a cash income. Farms are very small in size, because of heavy population pressure, the amount of land per head is limited. For instance, India has about an acre of cultivated land for every person, Japan has less than three-tenths of an acre and Mainland China only four-tenths of an acre. Extremely intensive methods of cultivation are adopted and almost every agricultural operation is done by hand. Subsistence farming is also to be met within monsoon lands.

Commercial Agriculture

In many parts of the world, subsistence farming is gradually giving place to commercial agriculture. With the development of transport on land, sea and air and with the expansion of trade and commerce, the farmer has found wider markets for his products and better prices too. Naturally, he has started specialising in one or two crops which yield him large profits. Given suitable climatic and soil conditions, a region would specialise in those agricultural commodities which yield good profits. Commercial agriculture, therefore, refers to the system of cultivation which is undertaken essentially for the market. In a country like India where subsistence farming was the rule, the farmer is gradually adopting commercial agriculture.

Large-scale commercial grain production is carried on extensively in the Prairies of U.S.A. and Canada, in coastal Pampas of Argentina, the Murray Darling basin in Australia and in the region extending from Ukraine to Western Siberia in U.S.S.R. Commercial grain farming in these areas is both extensive and highly mechanised. These regions have plenty of land mostly open and fertile but have low population. This has facilitated mechanisation.

Marketing is done easily because of the modern system of transport through railways and roads. Specialisation is a distinct feature of commercial grain farming. Wheat is the single most important cereal crop. This type of farming has some peculiar problems, as for instance, it involves heavy investment of capital in farm buildings, machinery etc. Besides specialisation in one crop may result in heavy losses if that crop is affected by adverse weather conditions in a particular year. Finally, it will make the farmer completely dependent upon the market forces.

Commercial Plantation Farming is another distinct and important form of commercial agriculture. It is the oldest of the modern types of large-scale specialised commercial agriculture. Plantation farming in tropical lands specialises in rubber, tea, coffee, cacao. It is generally organised by Europeans and Americans. The capital needed for plantations comes from temperate regions and the products of these plantations are generally exported to the temperate regions in Europe and America. At the same time, the administrative and technical staff, farm implements, industrial machinery, fertilisers, railway facilities, etc., come from outside areas, especially temperate regions. The labourers, mostly unskilled workers are, recruited from local or nearby districts. Though machines are used, much of the work in the plantations is performed by hand. Plantation farming is generally located near the sea for easy transportation.

Commercial Fibre Culture is yet another form of commercial agriculture and is similar to plantation farming in the tropics, in certain respects. For instance, the crop raised is not used on the farms but is exported or sold to local manufacturers. But in one important respect fibre culture differs from plantation crops. Fibre crops are generally raised in small land holdings, without complicated machinery, administrative staff, etc. However, in parts of U.S.A. cotton farms are increasing in size and many of them are very large. Though machinery is used to prepare the ground etc, much of the work in cotton and other farms is performed by hand, chiefly by the farmer and the members of his family, who also produce the bulk of their own foodstuffs. Production and trade in fibres such as cotton, jute, etc., are quite significant; for instance, international trade in natural fibres including wool equals about one quarter of exports of all agricultural products.

3. FACTORS AFFECTING AGRICULTURAL PRODUCTION

Farmers in U. P. or Madhya Pradesh may grow wheat as a subsistence food, while the Punjab farmers may grow wheat as a cash crop. Some farmers specialise, concentrating upon the production of rice or sugarcane or bananas. In Gujarat, farmers keep cows and buffaloes for milk, butter and cheese. But there

are many parts of the world where farmers keep few or no domestic animals. It will be a serious mistake to believe that the type of crops raised or animals reared, is purely accidental. In fact, there is nothing accidental about agricultural production. The type of crops raised, the form of agricultural practices and the size and nature of agricultural production in any part of the world are the result of a number of factors. These may be broadly classified into three types :

- (a) Physical Geographic Factors;
- (b) Economic Factors;
- (c) Other factors.

Physical Geographic Factors

The basic factor that influences agricultural production is the physical condition of a region or country. Different crops require different types of climate, weather and soil conditions. Unlike many other types of production, farming depends, to a high degree, upon the physical environment. In this connection, we should emphasise primarily the importance of climate and soil conditions for agricultural production.

(i) *Suitable Climate*—Take, for instance, the growing of a crop, say corn—such as its growth, blooming, the setting of the corn and the ripening of the corn—all these involve various processes of nature, which are slow and generally take an appointed time. MAN cannot speed up any of these processes and generally he is helpless. In manufactures, however, man can organise production in any way he likes; he can operate machines at any speed he desires; and he can control the quantity and quality of a product he produces in a factory or workshop. Climatic conditions are, thus, of great importance in agriculture. Whether a particular plot of land can grow cereals or pulses or fodder or whether a farmer would like to rear beef cattle or dairy cattle will depend largely upon climatic conditions.

(ii) *Fertility of the Soil*—It is the fertility of the soil which supports vegetative growth. No two soils are similar. Some soils are very fertile and some are not so. Some soils are warm and some are cold. Some soils are deep and some are thin. Some soils are heavy, while some are light. Some soils are sandy, and some are clayey; and so on. The black soil of the Deccan plateau is very good for growing cotton while the alluvial soil of the Cauvery delta is highly suitable for the growing of rice and bananas. Thus, the nature of crops to be sown and the success of farming will depend upon the structure, texture, workability and fertility of the soil.

From the beginning of time, man has always tried to modify the physical environment to his advantage. For example, whenever water is inadequate or it is seasonal, man has tried to

overcome it through artificial irrigation. He has also tried to improve and sometimes change the soil through the introduction of chemical and other artificial fertilisers, new and improved seeds, etc. In the form of hothouses, man has even tried to create an entirely artificial environment for crop production soil, moisture, humidity, temperature and even light are artificially created to produce any type of crops and at any time he likes. But modification of physical environment involves much effort and money. Naturally, the major portion of the agricultural effort all over the world is carried on under normal natural conditions. Of course, man is continually engaged in improving the soil and overcoming any adverse climatic conditions.

In general, climate is the principal basic factor which determines the geographical distribution of crops and of livestock. Soil is only the second basic factor which influences agricultural production.

Economic Factors

Given the physical geographic factors for a region, the actual crop pattern will depend upon economic considerations. If farming is carried on for subsistence, economic motive of profit will not normally affect agricultural production. But commercial agriculture is primarily influenced by economic considerations. Under economic factors, we should emphasise the existence of a suitable market for a product, remunerative price and the availability of cheap transport facilities.

(i) *Existence of Market*—There is no point in producing a product, say, sugarcane if there is no sugar factory nearby to buy it. Vegetable gardening is useless in a remote rural area where there is no market for vegetables, but it is extremely profitable near a city. Generally a farmer will be faced with the problem of choice between two or more crops which can be grown equally well on a plot of land. For instance, a farmer in Haryana with good irrigation facilities, may have to choose between cotton, sugarcane or chillies, all of which can be grown conveniently; and the farmer may decide on chillies because of a nearby market and good prices.

(ii) *Remunerative Price*—More important than the existence of the market is the availability of a remunerative price for a product. A farmer who produces for the market wants to sell his produce at a profit; otherwise, farming is not profitable and the farmer may be forced to sell away his land and go bankrupt. There is considerable variation in agricultural prices in the world and national markets and, therefore, there is a high possibility for high profits or huge losses in agriculture. A farmer would like to choose that commodity in which he expects to get a good price and therefore, a high margin of profit.

(iii) *Cheap Transport Facilities*—The availability of cheap transport facilities has an important influence on the nature of agriculture. As indicated earlier, the small farmer who produces crops for his own subsistence will not bother about transport facilities to the market, for even if he has some surplus to sell, he may do so in the village itself. But the farmer adopting commercial agriculture must have efficient and reasonably cheap transport facilities to enable him to sell his produce in the market. The transport facilities may be by road, rail, water or even by air.

(iv) *Supply of Labour*—The nature of supply of labour has an important influence on the nature of agriculture adopted. In most parts of India labour supply is abundant and is quite cheap. This is responsible for the continued adoption of primitive techniques of cultivation with more man-power and less of mechanical appliances. Where there is shortage of labour, large estates and collective farms have been used and extensive machinery is applied in these farms. Plantation farming (such as growing of tea, coffee, sugarcane etc.) has been organised only in those areas where plenty of cheap labour is found.

Economic considerations are, thus, very important and they influence and limit the type of farming in various regions of the world. There is competition between crops and one crop may outcompete the others. In U.P. and Bihar sugarcane has outcompeted all other cash crops. In Tamilnadu, chillies have competed out many other cash crops, because of the high price they have been able to fetch in recent years. Given physical geographic conditions, economic conditions exercise considerable influence on the cropping pattern and practices in different regions.

Other Factors

Among other factors which influence the nature of agricultural production, we may mention, social customs, religious influences and political factors. These factors are obviously of lesser importance than the first two types of factors.

(i) *Social and Religious Customs*—Sometimes, social and religious customs exercise strong influence on agriculture. In India, the Hindu custom of dividing the land between all the sons (and now all the daughters are also included) is responsible for fragmentation of holdings into small and tiny plots. The existence of too large a number of useless and dry cattle in India is due to the Hindu veneration of the cow as mother and the prohibition of beef eating. Likewise, the almost complete absence of pigs in the Middle East and North Africa is explained by Islam's prohibition of pork. It is clear that social and religious customs can have serious influence on farming and animal husbandry.

(iii) *Psychological Attitudes and Preferences*—Geographically rice should be grown in warm regions only but, in practice,

it is grown in such areas as Manchuria where climatic conditions are extremely unsuitable. The reason for this phenomenon is historical, viz., the Chinese who settled in these areas brought with them a taste for rice and grew it even though the conditions were not suitable for it. The production of beet sugar is said to have suffered severely in Europe for decades, as there was a popular belief that cane sugar was superior to beet sugar. Thus food preferences and prejudices based on psychological attitudes of people may exert some influence on farming.

(iii) *Political Factors*—Modern Governments can exert strong pressure on crop distribution and agricultural practices. A Government may adopt indirect methods such as tariffs, bounties or subsidies to persuade farmers to go for certain types of crops. Or it may directly compel farmers to put their land under particular crops required by the country. Mention may be made of the Grow-More-Food Campaign in our country since the Second World War. Often, the objective of self-sufficiency may also induce a Government to influence crop distribution.

4. LIMITS OF CROP PRODUCTION

Agriculture all over the world is thus influenced by physical, economic and other factors. On the basis of the above factors, geographers have recognised three different limits of crop production in a region. These are :

- (a) The Geographical Limit;
- (b) The Economic Limit; and
- (c) The Actual Limit.

The Geographical Limit

As we have seen already, certain physical geographic conditions are essential for the growth of particular crops. The two prime physical conditions are climate and soil conditions. From the point of climate, rice can be grown only in those areas where there is plenty of sunshine and water, throughout the period when the plant is on the land. Therefore, India and South East Asia are highly suitable for rice cultivation. Similarly, oranges and other citrus fruits require a special type of climatic condition known as the Mediterranean climate, with rainfall during cooler months and hot dry summer. Thus there are some absolute climatic limits for each crop. Besides, each crop requires particular soil conditions which will confine it to more limited areas within the absolute climatic limits. The geographical limits of production, therefore, refer to these limits imposed on crop production by climate and soil conditions.

The Economic Limit

It is not necessary that a crop should necessarily be produced within the geographical limit to production. Economic

conditions may force the farmers to restrict farming to still smaller areas. A given area may be geographically suitable for a particular crop but the yield in the area may not be high enough for commercial agriculture. Or it is possible that another equally good crop but commercially more profitable may out-compete the farmer. In the State of Iowa in the United States, corn has outcompeted wheat. Non-availability of market or absence of adequate and cheap transport facilities can also be other economic conditions. For instance, though Maharashtra and South India had a more favourable climate for the growing of sugarcane, they did not produce it till recently, because of the location of sugar mills in U.P. and Bihar.

Thus, economic factors may restrict crop production to areas smaller than the geographical limits. However, economic limits of crop production are not fixed permanently but will change in response to changing economic conditions. Increase in population and consequent increase in demand for foodgrains has led to the extension of cultivation to inferior or marginal lands. The setting up of sugar factories in Europe has led to larger cultivation of beet root.

The Actual Limit

The actual limit to production for any particular crop has to take into account not only the geographical limit and the economic limit but also other considerations. In the case of certain crops, geographical conditions may be suitable and production may be economically profitable, but the actual production may be restricted to a smaller area. A good example is the production of sugarcane in certain regions of Maharashtra. Climate and soil conditions are quite favourable; economically too, with the setting up of sugar factories, sugarcane cultivation is becoming useful. But sugarcane cultivation is still restricted to certain areas, possibly because it will take some time for the farmers to fully appreciate the benefits of sugarcane cultivation. It is often difficult for farmers to give up certain traditional crops and adopt new crops. Thus, the actual limit to production may be more narrowly marked.

Agriculture—Food Crops

1. WHEAT

Conditions of Growth—(1) Wheat requires a temperature of 50°F during its vegetative period and during the time of ripening, it requires a temperature of 66°F. At that time, minimum temperature of 60°F should remain for three months.

(2) The wheat plant requires moderate rain, 30" of annual rainfall being the best for it. As a matter of fact, wheat is seen to grow even in areas having less than 10 inches of annual rainfall. According to local conditions wheat is an irrigated crop or a dry farming crop.

(3) It requires moisture and cool weather during the period of germination and early growth ; warm and dry weather when the heads have formed ; a little moisture in order to swell the grain before ripening and finally a bright sunny harvest. Abundance of summer rain is injurious to extensive wheat farming. Where the rainfall is more in summer, the plant makes straw rather than grain. Besides, rust and other fungus diseases attack the plant. If the rain is very much, the grain shrivels before harvest, and it often decays after the harvest.

(4) Wheat requires a growing season of at least 90 days after the last frost. Warm regions of heavy rainfall are generally unsuitable to wheat cultivation. The temperate grass lands with their winter snows melting in the spring and with their light spring rain, are most suitable for wheat cultivation. It is because of this factor that almost all the wheat lands of the world are situated between 35° and 55° latitudes.

(5) For good quality wheat, there should not be a sudden change in temperature. The temperature should rise gradually. A sudden rise in temperature or occurrence of dry dusty winds as happens in India dries the sap of the grain and the quality of the grain suffers. The grain instead of being round, is elongated.

(6) Wheat requires a soil of high fertility and fine texture. Although it can flourish on a wide range of soils, sandy loam is the

best. Those soils which have a large quantity of humus in them, produce glutenous wheat. As wheat is an exhausting crop, it requires the use of fertilizers or manuring after every second or third year. The black soil is also good for wheat cultivation.

(7) The best wheat lands are gently undulating with a very good drainage system. The land must be level so that machinery can be extensively used.

Varieties of Wheat and Yield—Wheat is of two kinds, *winter wheat* and *spring wheat*. The ideal wheat climate with the rainy winter and dry summer is sometimes called the mediterranean type. It is most typical and suitable for the winter wheat. This climate is to be found upon margins of the six desert regions and in the transition latitude between the zones of dry winds and the prevailing westerlies. For spring wheat, the typical climate is to be found in the temperate grassland, where the winter snows melt in spring and the light spring rain gives a very good climatic impetus.

Commercial wheat is called *hard* and *soft* or *white* and *red*.

Hard wheat is produced in dry lands while soft wheat comes from humid regions. The hard wheat is glutenous but the soft wheat contains more strach. Canada and Russia produce hard wheat. The countries of Western Europe produce soft wheat. The soft wheat is also called white wheat; red wheat is the name for hard wheat. Hard wheat grows best in dry and cold climate conditions while the soft wheat is yielded by warm and moist climate.

Wheat cultivation is being continually extended to new lands and is spreading more and more to the cold latitudes of the Arctics. This has been possible due to the improvement in seeds and the cultivation of new varieties which are better. By cross breeding, drought resisting and grain holding qualities have been developed in wheat. *Red fye* and *durum* are the varieties which have caused great extension in the spring wheat belt of the U.S.A. Several varieties of Australian wheat like *kubanka*, *nodak*, *marquilloo* etc. are other varieties which have high yield, are rust resistant or drought resistant and are quick maturing.

The *yield per acre*, as given in this table differs from place to place.

Countries	Bushels	Countries	Bushels
Argentina	... 15	Netherlands	... 16
Australia	... 18	Italy	... 24
Canada	... 17	Rumania	... 16
United States of America	... 18	Russia	... 14
France	... 26	China	... 16
New Zealand	... 14	India	... 10

Along with the difference in yield, *the harvesting time* is also different in different parts of the world. Because of the differences in the geographical situation, it is seen that every month wheat is being harvested in some part or the other of the world. The following table will show the different harvest seasons in different parts of the world :—

Harvesting Season		Countries
January	...	Argentina, Australia.
February	...	Argentina, Australia, Chile.
March	...	India, Upper Egypt.
April	...	India, Mexico, Cuba, Lower Egypt, Persia, Syria.
May	...	Spain, U.S.A., China, Algeria, Asia Minor.
June	...	U.S.A., France, Afghanistan, Japan.
July	...	France, U.S.A., Canada, Russia, Hungary.
August	...	U.S.A., France, Canada, Russia.
September	...	U.S.A., Russia, Scotland.
October	...	Finland, N. Russia.
November	...	Argentina, Peru, S. Africa.
December	...	Argentina, Australia, South Africa.

Because of the different harvest seasons and also on account of the remarkably well-developed means of transport, wheat reaches the world markets and there is an equalizing influence on the international prices.

Areas of Production—All the conditions favouring the growth of wheat are found to exist in the regions of *mediterranean climate* and in the *temperate grasslands*. India and Pakistan, even though outside these climates, are important producers of wheat. The chief countries producing wheat can be divided into the following three categories :—

1. The thickly populated countries of Western Europe, where by means of intensive methods, wheat is grown as an important crop of mixed farming. Great Britain, France, Belgium, Holland, Denmark and Germany are important producers in this region.

2. Sparsely populated areas of eastern and south-eastern Europe ; Hungary and European Russia come into this region.

3. New countries where agricultural land is vast but the population is very sparse. By means of extensive agriculture and with the help of machines, wheat is grown there and large surpluses are obtained: Canada, Australia, Argentina, and Central U.S.A. are the chief countries in this region.

As a matter of fact, three-fourth of world's production of wheat comes from ten countries which, in order of importance, are

the U.S.S.R., U.S.A., China, Canada, France, India, Argentina, Italy, Australia and Turkey. Although the extent of producing land is continually expanding and with the help of science and technology, newer varieties of wheat have been discovered so that areas of wheat cultivation have now extended as far north as 66°N latitude, still the bulk producing lands are found to exist in the following two belts :—

1. The *Eurasian belt* which spreads from the Danube river in Central Europe to Lake Baikal in Siberia. This belt is 3600 miles long and 200 miles broad.

2. *North American Belt*, which extends from the Gulf of Mexico to Edmonton in Canada, is about 1750 miles long and 200 miles broad.

On another basis wheat producing lands of the world can be divided into two groups. China, Great Britain, France, Belgium, Holland, India and U.S.S.R., produce wheat for their home consumption. The U.S.A., Canada, Argentina and Australia produce wheat mainly for export.

Canada—Canada is the fourth principal producer of wheat in the world. Manitoba, Saskatchewan, Alberta and Ontario are the chief wheat producing provinces of Canada. The first three provinces produce spring wheat while the last along with Quebec produces winter wheat. The spring wheat region is more important. Winnipeg and Port Arthur are the chief centres of wheat collection. Because of sparse population, most of the wheat is exported. Canadian farmers carry on scientific and mechanised agriculture on vast fields. There are huge elevators where wheat is stored before it is transhipped into ships. 23% of the world export of wheat comes from Canada where two crops are grown in a year. In Canada production has remained roughly constant at 17m. tons over the past five years but exports have fallen by nearly 7m. tons over the past two years, from 14.8m. to 8m. tons.

U.S.A.—U.S.A. is the second largest producer of wheat in the world and 15% of the world's production comes from U.S.A. Kansas, Nebraska, Oklahoma, Texas, Ohio, Indiana, Illinois, Michigan, Washington and Oregon are important for winter wheat. The quick maturing spring wheat is grown in the North Dakota, Montana and the Red river basin of Minnesota. So much wheat is grown in this latter region that it is known as the 'bread basket of the world'. Minneapolis, Duluth, Chicago, and Buffalo are important wheat centres.

By manipulation of acreage controls, or perhaps because of the better farming techniques that they seem to encourage production of wheat in the U.S. has risen by 7m. tons since 1965, and stocks have risen to 21m. tons. Exports have fallen by roughly 6m. tons in the last year to 14.6m. tons, at which figure the U.S. is still by far the largest exporter.

U.S.S.R.—U.S.S.R. is the greatest producer of wheat in the world. It has extensive wheat lands but the most important areas are the Black soil region of Ukaraine, North Russia, Western and Eastern Siberia. Wheat is grown with the help of machines on collective farms and both winter and spring crops are obtained. Ukraine, North Caucasus and Crimea are the regions of winter wheat while Volga river valley and Trans-Ural region is important for spring wheat. Odessa and Khorasan are important wheat centres.

India and Pakistan produce 1/10 of the world's wheat but because of huge population, the home consumption is so great that nothing is left for export. East Punjab, Madhya Pradesh, Maharashtra and Uttar Pradesh in India and West Punjab, North-west Frontier province and Sind in Western Pakistan are the most important producers of wheat.

Europe—The mediterranean lands in Europe have always been noted for wheat production. Optimum conditions of growth are found and wheat is extensively grown. Italy is very important in this respect. Wheat is grown in all parts of Italy. Turkey, France, and Spain are other wheat producers. In Portugal and Greece also, it is the chief grain. Eastern and Southern England are the chief districts of wheat production in Great Britain. Suitable climate, level plains and fertile soils are the great advantages. Although France has got 1/6th as much land it has wheat crop nearly half as great of U.S.A., Belgium, Holland, Western and Southern Germany are also important wheat growers in proportion to their areas. But the great industrial populations have a very high rate of consumption, and therefore, these regions have also to import from outside.

Far East—In China, wheat is grown widely in the Hwang-Ho valley. The two important provinces for wheat growing are Shansi and Shensi. The great plain of Siberia has also a promising future as far as wheat cultivation is concerned, and under the impact of Soviet science, wheat cultivation is gradually expanding. Manchuria and East of Lake Baikal have also a very good climate and it can be a very important wheat area.

Australia—Australia has extensive wheat lands in the Murray Darling basin in the south-east and the mediterranean regions in the south-east. But the extent of wheat lands is limited by increasing temperature and humidity on the north by high mountains on the east and by lack of rainfall on the west. Still wheat occupies a very important place in Australian economy and most of the produce is exported because the consumption at home is not very much.

Though Australian and New Zealand wheat production is much lower than most of the other continents; their industry is fully mechanised and highly efficient. In Australia, a mere 7134 men are engaged in actual field production of wheat grain.

This means that each man produces about 51,724 bushels of wheat grain.

Argentina—Argentina, specially the Pampas region, is very suitable for winter wheat. The wheat belt spreads in a crescent of 600 miles. On the north, the extent is limited by increasing temperature and humidity; on the west, by declining rainfall; on the south-west by the competition with animal husbandry and on the south-west by aridity. 60% or more of the produce is exported because the local consumption is very little

**Table V : 1—World Wheat Production in Certain Countries
1964-69**

		1964-65	1965-66	1966-67	1967-68	1968-69
		(M. Tons.)				
W. EUROPE	...	46.9	48.6	44.5	51.9	51.7
E. EUROPE	...	14.4	18.6	18.1	20.4	20.4
U.S.S.R.	...	74.4	59.7	100.5	71.3	96.2
CANADA	...	16.3	17.7	22.5	16.1	17.7
U.S.	...	34.9	35.8	35.7	41.4	42.7
ARGENTINA	...	11.3	6.2	6.2	7.3	5.9
ASIA	...	31.7	35.6	34.6	38.1	44.5
AUSTRALIA	...	10.0	7.1	12.7	7.6	14.6

International Trade in Wheat—If we consider the various conditions, we find that the chief importers of wheat are the manufacturing people of Western Europe and the chief suppliers are the U.S.A and Canada, Argentina and Australia. Formerly, India also used to export some wheat and some wheat also reached from the countries of South-Eastern Europe. The plains of Hungary and Rumania in the Danube valley and the black sea basin of Soviet Russia also export surpluses in normal times. But the fact is that the U.S.S.R., China and India are so thickly populated and their home consumption of wheat has been continuously rising so that they do not have any appreciable surplus for export.

46% of the world's wheat coming in international trade is obtained from Canada, Australia, and Argentina, because these are very thinly populated and even though they produce only 19% of the total world crop. American wheat is in great demand in the markets of Europe. 2/3rd of the U.S.A. wheat is exported to Europe and 1/4th is exported to the countries of Asia.

The U.S. produces 15 per cent of the world's production and exports half of it. The Soviet Union produces 22.8 per cent of the world's production but imports occasionally to meet the internal demand. Canada produces 5.8 per cent, France 5.2 per cent and have surplus stocks. Other exporters are Australia and Argentina.

U.S.A.	48%	Argentina	10%
Canada	23%	Australia	13%

Table V : 2—World Wheat and Flour Exports 1964-69

<i>Source</i>		<i>1964-65</i>	<i>1965-66</i>	<i>1966-67</i>	<i>1967-68</i>	<i>1968-69</i>
		<i>(M. Tons.)</i>				
ARGENTINA	...	4.4	7.9	3.1	1.4	2.8
AUSTRALIA	...	6.5	5.7	7.0	7.0	6.0
CANADA	...	11.9	14.8	14.8	8.9	8.0
E.E.C.	...	6.1	6.3	4.7	5.6	4.0
U.S.	...	19.6	23.4	20.2	20.4	14.6
U.S.S.R	...	1.2	2.2	4.1	5.1	5.3
OTHERS	...	1.5	2.2	2.4	3.7	4.3, 5.3
TOTAL	...	51.2	62.5	56.3	52.1	45.0, 46.0

The greatest importer of wheat is Great Britain. It imports more than 30% of the wheat coming in the international market. India, Germany, Japan and Brazil are other importing countries. 48% of world's wheat goes to Europe alone.

World trade in wheat has fallen from an all-time high of 62m. tons in 1965-66 to 45m. tons in the last harvest year. Yet world wheat production, excluding that of the Communist countries, has risen by almost 30m. tons, and the forecast wheat stocks of the major exporting countries now total over 60m. tons, which is more than one year's trading.

Optimists point out that stocks are not yet quite as high as they were in 1960-61, and that these were liquidated fast by sales to the Soviet Union, China and the Indian sub-continent, which brought these stocks down to a dangerously low level. But since then the Russians and the Chinese have reduced their purchases ; the Soviet Union is probably a net exporter, the Chinese only import marginal supplies, while India and Pakistan, which together took something over 10m. tons annually in the mid-1960s, are becoming self-supporting, thanks to the use of dwarf wheats discovered in Mexico.

Another vital factor in the equation is the growth of wheat production in Western countries, including the E.E.C. and Britain, which were at one time large-scale importers. Wheat growing is encouraged by all their Governments, and while in Britain the increase has been marginal, mainly for climatic reasons, it has gone ahead well in the E.E.C.

2. RICE

Rice is the staple food of the people of the tropics as wheat is that of the people living in the temperate regions. As such, it is the main cereal food grown in the tropics and in some parts of the warme temprate zones, where the summer rain is heavy.

Rice requires a heavy summer rain while wheat flourishes under dry summer. If rice is tropical crop, wheat is a temperate crop. Rice is grown best under humid farming while wheat achieves optimum conditions under dry farming.

Then unlike wheat, rice cultivation cannot use machinery, nor can it be practised on vast extensive lands. The best type of rice is grown in small nurseries by the method of transplantation and intensive agriculture while wheat achieves bulk production through extensive agriculture.

As a matter of fact, rice and wheat are different not only in the climatic, soil and economic conditions required for their growth or in the regions of production, but also in the fact that while rice growing areas are thickly populated, wheat producing areas are regions of sparse population.

Rice is the staple food of about 50% of the world's population and it is used for several other purposes besides eating. Several kinds of liquor are distilled from rice while its husk is utilized in the manufacture of slippers, hats and sound-proof walls.

Conditions of Growth—1. Rice plant flourishes most in the hot and wet areas in the tropics. It requires an abundant supply of water during the growing period and minimum rainfall of 40" per year is necessary. But it can grow very well also in those areas where about 80" of rainfall is received in a year. As a matter of fact, it is widely grown in areas having a rainfall of 40" to 80" per year.

2. Along with heavy rainfall, it also requires a high average temperature. The average annual temperature should be 75°F throughout the vegetative period and for a brief spell, when the grain is ripening, it is good to have 80°F temperature for some time. Normally, it is seen that the July and January Isotherms of 75°F mark the northern and southern-most limit of rice crop in the north and south hemispheres respectively.

3. Rice plant grows very fast when it is flooded. Six to nine inches of flooding per day often brings about as many as five crops in a year. Flooding is most necessary in the earlier part of its growth.

4. Since the plant likes flooding, level fields which can be easily flooded or impervious clay soils which can hold water are the best. Clay soils are normally found in the deltas of the rivers. It can also grow very well in those alluvial loams where the upper layer is porous and the lower layer is impervious.

5. In rice cultivation, every work is done by hand. The tilling of the land, trans-plantation of the paddy plants, harvesting of the crop, husking and threshing of the paddy all is done by hand. Because of the requirements for enormous manual

labour, it is necessary that cheap unskilled labour must be easily available. Because of this advantage, the heavily populated monsoon lands are very suitable for rice cultivation.

Varieties and Yield of Rice—Rice is of two types—*Lowland rice* and *Upland rice*.

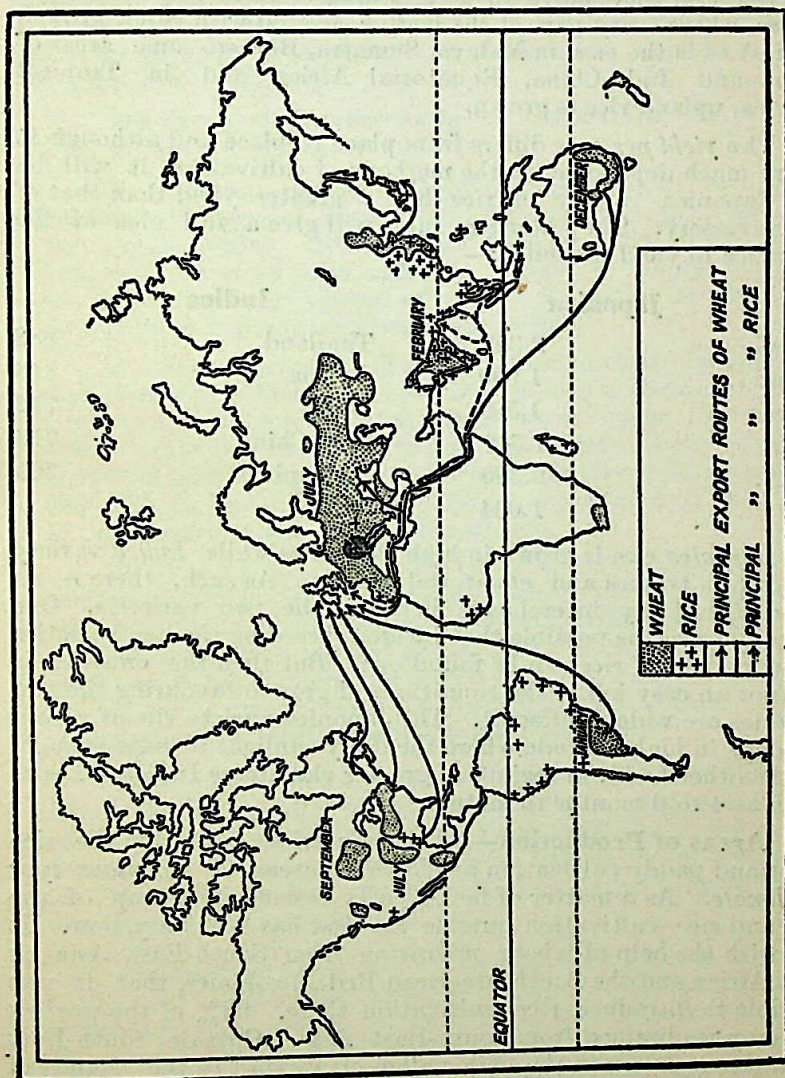


Fig. 20

Lowland Rice is grown under water. In growing lowland rice, intensive methods are applied and this is grown in densely populated lands where even one foot of land is very valuable. Often irrigation is applied to the cultivation of lowland rice. In China and Japan, lowland rice is grown on hill terraces.

Upland Rice is very much like wheat or oats and is grown chiefly where population is sparse and the land is very much abundant. In the cultivation of upland rice, extensive methods are practised. After cutting down the forest, land is planted with paddy but as soon as two crops have been obtained, the field is deserted and they move on to new areas. In those parts of the tropics, where every part of the land is covered with thick growth of forest as is the case in Malaya, Sumatra, Borneo, some areas of Burma and Indo-China, Equatorial Africa and in Tropical America, upland rice is grown.

The *yield per acre* differs from place to place and although it is very much dependent on the methods of cultivation, it will be seen Japonica variety of rice has a greater yield than that of Indica variety. The following table will give a full idea of the difference in yield (pounds) :—

Japonica		Indica	
Japan	2,352	Thailand	888
Egypt	1,890	Burma	816
Korea	1,593	India	772
China	1,549	Indo-China	716
U.S.A.	9,390	Philippines	703
Java	1,034		

Japonica rice is grown in high latitudes while *Indica* variety is grown in tropics and equatorial regions. As such, there is no possibility of any interchange between the two varieties. One thing, however, is possible that by cross-breeding the two varieties a new variety of rice can be found out. But then the crossing is also not an easy job. The conditions of growth favouring the two varieties are widely different. The Japonica variety ripens within 100 days in high latitude where the daily sunlight is quite enough. On the other hand, in regions of greater cloudiness Indica takes as much as 4 to 6 months to mature.

Areas of Production—All the conditions favouring the rice plant and paddy cultivation are found in areas of *moonsoon type of climate*. As a matter of fact, rice is essentially a crop of the east and rice cultivation outside the east has been very slow. It was with the help of labour migrating from South-East Asia or East Africa and the South American British colonies, that it was possible to introduce rice cultivation there. 98% of the world's rice crop is obtained from South-East Asia. Outside South-East Asia, rice is grown in the Nile valley of Egypt, in the islands of Mauritius, Madagascar in the Indian ocean, in British Guinea, Trinidad and central British America, Brazil and Italy.

Besides these, there are certain regions which have practised, wheat as well as rice growing with equal success. India, Argentina, Canada and U.S.A. are such countries. We may take Italy, Spain

and Portugal also in this category. The Po valley of Italy grows $\frac{2}{3}$ rd as much rice as U.S.A. ; Spain grows about $\frac{1}{2}$ as much as Italy. In the U.S.A., rice is mostly grown in the states of Georgia and Carolina. The quality is no doubt good but the quantity is insignificant. The most important and the newest is the rice cultivation on the plains of the Gulf Coast. Rice cultivation is also carried on in California. In these temperate lands, rice cultivation is done by means of irrigation and the natural dampness of the weather is well utilized.

The rice producing areas can be divided into the following three groups :—

1. *Monsoon regions*—There the production is huge but because of excessive population, the consumption of rice is also very great. China, India, Japan, Ceylon, East Pakistan and Indonesia come in this category. These countries, no doubt, produce a very large amount of rice but to meet their local needs, they have to import rice from outside also.

2. *South-East Asia*—Burma, Thailand and Cambodia are such countries which have less burden of population and, therefore, even their lower production leaves a surplus for export to other countries. In the Irrawady valley and delta of Burma, about 59 lakh metric tons of rice is produced every year from 39.5 lakh hectares, $\frac{2}{3}$ rd of this is exported and 30% of the world's export of rice comes from Burma.

3. *Non-Asiatic lands*—In those other parts of the world where facilities for irrigation exist or where Mediterranean type of climate is found, good quality but small quantity of rice is grown. The Mississippi delt and California valley in the U.S.A., Nile delta in Egypt, South-Eastern part of Po valley in Italy, South-Eastern Spain, Murrumbidge area in Australia and Central America, West Indies and British Guinea are such regions.

China—China is the greatest producer of rice in the world. About 40% of the total world production is produced in China and the rice bowl of China is Yangtze Basin. In South China, double crop of rice is produced. About 70% of the cultivated land in China is under rice, but because of the huge demand at home, nothing is left for export.

India—India is the second largest producer of rice in the world and $\frac{1}{3}$ rd of the area devoted to food grain cultivation is under rice. West Bengal, Bihar, Madhya Pradesh, Orissa, Andhra Pradesh, Madras and Uttar Pradesh are the important areas of rice cultivation in the country. Even though rice is considered a rabi crop as many as three crops of rice are produced in eastern India. The yield per acre in India is very low and efforts are now being made to increase the yield by employing intensive methods of agriculture. India has to import sufficient quantity of rice every year.

Japan—Rice is the most important crop and the division of agricultural land in Japan is rice lands and other lands. Rice is grown whenever and wherever it is possible to grow it. The Japanese method of paddy cultivation is highly intensive and most scientific. Highest yield per acre is obtained but even then Japan has to import 20% of its needs from the countries of South-East Asia.

South-East Asia—Burma, Thailand and Indo-China are noted for their surplus crops. They do not have a very high yield or a very big acreage but because of lower consumption at home, they have great surpluses. 2/3rd of the land in Burma, 90% of the total cultivated land in Thailand, the Mekong and Tonking valleys and the coastal plains of Annam and Cochin-China are the most important rice lands. The quantity of rice grown in these lands is also inferior—it is of the Indica type.

For the last so many years, *Soviet Union* has been making great efforts to cultivate rice and about 5 lakh acres of land in Azerbaijan, North Caucasia, Kazakh and the Far East is devoted to paddy cultivation. The average yield per acre is about 52 bushels.

Paddy production has risen again in the current season and at 193 million tons (excluding mainland China, North Korea and North Vietnam) exceeds the previous season's record crop by 3.6%.

Trade in rice—Normally trade in rice is very much limited. Only about 7% of the world's production comes in international trade. The trade in rice may be said to be of two types.

1. *Local and Regional*—India, China, Japan, East Pakistan, Indo-China, and Philippines no doubt produce rice but because of excessive population, their home consumption is so great that they have to import rice from other countries who are their neighbours. Therefore, this is the trade between the great rice eating and rice producing countries of the east. The deficiency of one is made up by the surplus of another. The chief importers are Ceylon, Malaya, Java, Japan, China and India. The chief exporters are Burma, Thailand and Cambodia.

2. *International*—Burma, Thailand, Indo-China and U.S.A. are the exporters of rice while the whole of Europe excluding Spain and Italy, both the Americas except U.S.A. and Brazil and most parts of Africa and Australia import rice for giving variety to their food. Egypt also exports some rice.

The greatest problem about rice cultivation and trade therein has been that the rice eating population is continuously on the increase, while the methods of rice cultivation remain old and primitive. 70% of the people of Asia consume rice and the increase in population has been at the rate of 2.5 per cent so that with its population of 1867 millions, there are 381 million more people in Asia than the population of the rest of the world put-

together. As a result of this, the most recent trend has been that the countries of South-East Asia, which formerly used to export rice now meet their deficiency by importing bread grains from North America and rice from Egypt and Brazil.

The rate of increase in the production of paddy is slowly but surely overtaking population growth. The spirited effort of the Asian countries brings fresh hope. World rice trade declined in 1969 for the fourth consecutive year. The value of world trade declined by 10% and export earnings from rice for most exporting countries dropped further.

3. SUGAR

Sugar is a very important element in man's food and it is used by all the people whether they are rice-eating or wheat-eating. There are various sources from which sugar can be obtained. All the fruits have a little or more sugar. Grapes, oranges, dates and maize are sufficiently rich in sugar. The sugar can be obtained as a juice from various other vegetables and trees, both in the temperate and tropical zones. But the main plants from which sugar is mostly obtained now are two :—

1. Sugar-cane, which is grown in the tropics; and
2. Sugar-beet, which is grown in the temperate latitude.

From the point of view of international trade, cane sugar is much more important. Sugar made from sugar-cane accounts for 57·7 per cent. of total world sugar production and that from sugar beet is only 42·3 per cent. of world production of 70 million short tons.

Sugar-cane

Sugar-cane is the plant of tropical latitudes and it requires a hot and moist climate. Its cultivation is carried on between the 37° N and 33° S latitudes.

Conditions of Growth—1. The best crop of sugar-cane is obtained when the temperature is 75°F to 80°F all the year round and the annual rainfall is about 60 inches. But if rainfall or the moisture supply is too much, the quality of cane suffers and the juice remains poor. The sugar-cane plant is highly susceptible to frosts and, therefore, freedom from frosts is essential. Dry weather at the time of harvest is also very essential. Although not very essential, the sugarcane is generally better in those are-as where sea breezes blow.

2. Sugar-cane plant grows upto a height of 8 to 12 ft. and the stalks are cut annually. It remains on the ground for about 10 to 11 months. As such, it consumes a lot of elements present in the soil. So, fertile soil is very essential. Clay loams are the best. If they are rich in salt and lime, it is still better. The

land must be level but water must not stand on it. Crop rotation and heavy manuring are other means of replenishing the soil fertility.

3. Although sugar-cane cultivation does not require much careful hand work, the crop is harvested by hand, and, therefore, cheap manual labour is essential at the end of the growing season. Again, the type of work requires male labour and not women and children labour.

4. As the sugar-cane stands for the large part of the year, it requires a great financial and patience on the part of the farmers. The farmers have to wait for the crop to mature and yield return after a sufficiently long time.

5. Sugar-cane as such, is not used by man but it is processed into cane sugar at the factories. This brings into focus the transport of the cane from the field to the factory. The sugar-cane fields are muddy and distance to the factory is often in accordance with the size of the factory. If the distance is great, not only the transport charges are heavy but the quality of the cane also suffers in transit.

6. For its commercial growth sugar-cane requires freedom from competition and, therefore, it is often seen that cane sugar which depends on sugar-cane cultivation has always progressed under Government protection and finds its best results on plantations.

Uses—Sugar-cane is useful in more than one way. Besides yielding sugar which is the main product, every one-hundred ton of dry sugar-cane yields or can yield if properly utilised, the following products :—

2986	gallons of Gasoline.
3430	„ „ Medium quality oil.
1210	„ „ Lubricants.
845	pounds „ Raw sugar.

The secondary products of sugar refining are useful in the plastic industry. The refuse left over (*bagasse*), after the cane has been crushed, is an important raw material for the paper industry.

Areas of Production—Most of the cane growing lands are found in the tropical latitudes. Still the cane growing lands of the world can be divided into three groups :—

1. Countries growing sugar-cane on *river valley plains*. India and China are the most important countries in this category.
2. *Islands* growing sugarcane. Cuba, Java, Puerto Rico, Philippines, Mauritius and Jamaica are important names in this category.

3. *Coastal Plains*—The eastern plains of Brazil, Mississippi delta in the U. S. A., coastal plains of Natal in Africa and the eastern coastal plains of Queensland in Australia are very important areas in this category.

Table V : 3—Sugar-cane yield per Acre (tons)

Hawaii	80	Philippines	27
Java	50	Mauritius	19
Peru	41	Cuba	17
Egypt	40	U.S.A.	20-30
Puerto Rico	50	India	15
Farmosa	28		

Cuba—Cuba is the largest sugar-cane producer in the world. About 1/2 of all the cultivated land in Cuba is under sugar-cane, which is the most important source of national income; 1/8th of the total sugar produced in the world comes from Cuba. Because of good climate, the work of crushing the cane and making sugar goes on for 10 months in a year. Sugar-cane cultivation is done on a large scale and on the most scientific lines. Sugar-cane plantations are the usual rule. Almost all the sugar produced is meant for export. The situation of Cuba is another great advantage. U.S.A., which is the great consumer of sugar, lies next door to it and expenses on transport are very small. 4/5th of the total export trade of Cuba consists of sugar. The most important factors that have helped Cuba to gain position in sugar production are a stable government, a population superior to that of most tropical countries and an abundance of good, smooth, rich and well-drained limestone soil. The only thing which is not helpful to sugar industry there is the high cost of labour. There are large estates of sugarcane plantations and they have their own mills. From these estates, railways and tramways radiate in different directions. The output of sugar in Cuba has been consistently going up but its estranged relations with the U.S.A. have proved to be a great setback although with the help of other countries, Cuban sugar has gained newer markets.

Hawaii Islands—Hawaii islands are second only to Cuba as a source of sugar supply to the American market. Here, the yield of sugar per acre is the highest in the world and the lava soil is very good for sugar-cane cultivation. Sugar-cane fields are also irrigated, specially on the leeward side of the islands. Highly specialized machinery and extensive use of commercial fertilizers along with a very comprehensive system of irrigation are a few of the many effective measures employed in scientific agriculture here.

Java—Java is an important island of Indonesia and sugar-cane cultivation holds a very important place in the economic life.

of this island. About $\frac{1}{6}$ th of the total world crop comes from Java. The eastern part of the island, where formerly rice used to be cultivated, is very important for sugar-cane growing, more than $\frac{1}{3}$ rd land is not allowed to go under sugar-cane cultivation. The quality of Java cane is much superior and it is full of juice. Crop rotation specially with maize and beans is the usual rule. Japan and China are the most important markets for this sugar.

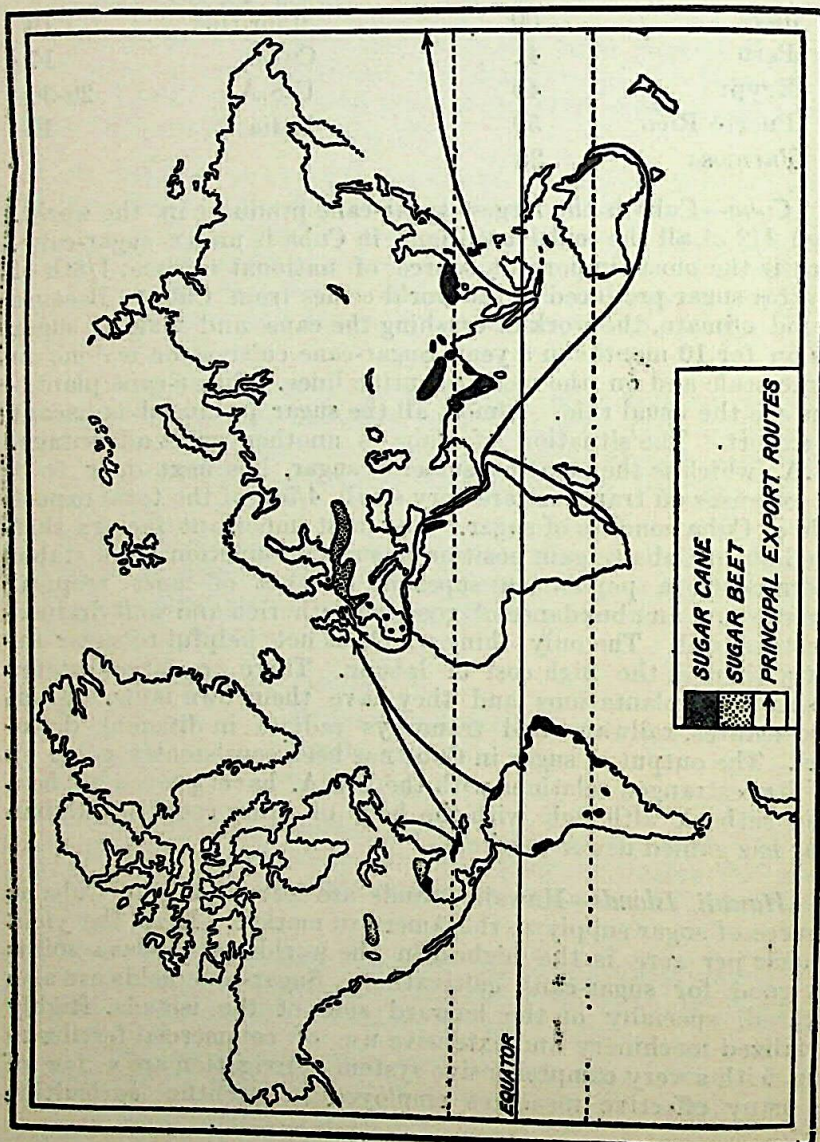


Fig. 21

India—India produces $\frac{1}{4}$ th of the total sugar-cane crop of the world and holds the second position in sugar-cane cultivation.

1/2 of the total worked acreage under sugar-cane is found in India but because of unscientific methods, a long dry period and the system of selling the cane by weight, we find that the yield per acre is very low and the quality is very inferior. U.P., Bihar, Maharashtra are the chief areas of production but sugar making is carried on only for 5 months in a year.

Brazil holds a very important position and has a very bright future. Northern Australia, Argentina and Philippine islands are other important producers of sugar-cane. From this, it will be seen that sugar-cane is grown mainly in the non-industrial regions of the tropics where other local industries are mostly agricultural and the labour is cheap. *Egypt* also has excellent resources of soil, sunshine and irrigation water for sugar-cane cultivation. *Natal* in South Africa has also a very suitable cane growing climate but the land area is small. Sugar is the predominant export crop of the two tropic islands of *Mauritius* and *Reunion* in the Indian ocean near Madagaskar. The labour employed there consists of coolies imported from India and China.

Table V: 4—Sugar Crops

(In thousand long tons Raw value 96°)

	1967-68	1968-69
Antigua	5	3
Barbados	159	150
British Honduras	64	70
Guyana	316	340
Jamaica	455	464
St. Kitts-Nevis	39	40
Trinidad and Tobago	239	245
Nigeria	22	28
Rhodesia	160	160
South Africa	1,795	1,605
Swaziland	150	145
Mauritius	628	587
Kenya	90	100
Uganda	160	175
Mozambique	202	216
World Total : Cane	36,148	37,888
Beet	29,232	29,316
All Sugar (World total)	65,380	67,204

World production in 1967-68 at 6,53,80,000 tons is higher by 17,23,000 tons compared with the previous year. Though Cuba's production declined to barely 5 million tons, most of the producing countries have more than maintained their output level. South Africa, with an estimated production of 67 million tons in 1968-69, has shown an improvement over last year's output.

In the face of increasing production the demand has grown by only 2.3 per cent.

International Trade—U.S.A., Great Britain, Japan, Germany, Holland and France, where industrialization has taken place at a very fast rate, are the chief importers of sugar.

Table V : 5— Per Capita Consumption

	(K. G.)
U.K.	53.9
U.S.	47.3
Canada	47.1
Egypt	58.0
Australia	17.6
Germany (W)	33.8
India	18.0

The main export supply of sugar comes from the rich plains and favoured tropical islands such as Cuba and Java, where the production is very high, but the internal consumption is very low. Hawaii, Philippines, Puerto Rico are the secondary sources of supply. The U.S.A., gets its supply from Cuba, Philippines and Hawaii islands. After the recent break with Cuba, it has been getting a part of its supply from India. Australia, Mauritius, Natal and British West Indies send sugar to Great Britain. Formosa and Java export sugar to Japan, Ceylon, Malaya and Burma. In recent years, India has been coming fast in the export market and has been exporting sugar to South-East Asia, Middle-East and East Africa. As a matter of fact, now sugar-cane is grown for export at a distance from the sea-shore and ocean transport is the chief means employed in the international trade.

The sugar market of the world is of two kinds :—

1. Protected high price market, and 2. Free cheap market.

In recent years, the role of the free market both in production and trade has been gradually declining. There is an International Sugar Council which controls and regulates trade in sugar. It fixes the quality and price of sugar for the different exporting countries.

**Table V : 6—New International Sugar Agreement
Basic Export Tonnages For Selected Countries**

	1969 <i>Thousand of metric tons</i>
Australia	1,100
Brazil	500
British Honduras	22
China (Taiwan)	630
Cuba	2,150
India	250
Mauritius	175
South Africa	625
Swaziland	55
Uganda	39
West Indies	200
Total	7,567

The 1969 agreement, which envisaged basic export tonnages, variable by up to 15 per cent, of 75,67,000 tons was approved by 27 principal countries. To this a fixed amount of 16,32,000 tons has to be added to cover small producers, re-exports from Russia and East European countries as well as a 'hardship fund' of 1,50,000 tons. The U.S., not a party to the new international pact, imported approximately 4 million tons of raw sugar under her own quota system in 1969. The E.E.C. countries have not included themselves in the new arrangement.

Sugar Beet

1/3rd of the total world production of sugar comes from sugar-beet, which is a root plant grown in temperate regions. Sugar-beet is also used raw like a vegetable and is grown once in four years by carefully rotating it with other crops.

Sugar-beet Areas

U.S.S.R.
U.K.
U.S.A.
Poland
W. Germany
France
Czechoslovakia
South Africa

Sugar-cane Areas

India
Indonesia
Philippines
Australia
Brazil
China
Cuba
Hawaii
Mexico

Comparison Between Cane Sugar and Beet Sugar—The *climate conditions* required are very much different. While sugar-cane is a tropical plant, sugar-beet flourishes in temperate regions.

The two also differ in their *regional distribution*. Cane sugar is produced in the non-industrial tropical areas of dense population, while sugar-beet grows best in the highly industrial and densely populated regions of the temperate latitudes.

Sugar-cane cultivation is carried on *plantation* basis while the sugar-beet cultivation is carried on *mixed farming* lines.

Sugar-cane does not require such careful *hand work* as does the sugar-beet. In its production, machinery can be employed which is not possible in the case of sugar-beet.

Sugar-beet is a *kind of root* which can be obtained by overturning the earth but sugar-cane is a *tall plant* which shoots its branches above the earth.

Sugar-beet occupies a larger *area* than sugar-cane.

Cost of production of cane sugar is less than that of beet sugar.

Cane growing is a far less *scientific* agriculture than is beet growing. Sugar-cane requires far less manuring also.

Sugar-cane requires male *labour* while sugar-beet requires child and woman labour.

International *export trade* is much more in cane sugar than it is in the case of beet sugar.

Cane yields *raw sugar* equal to 12% of its weight while the best beet yields about 20% of its weight as raw sugar.

Conditions of Growth—1. Moderate amount of spring and summer rain, moderate heat in summer and cool dry autumn furnish the ideal climatic conditions for sugar-beet production. The sugar-beet plant requires 160 to 170 days of growing period, and the extremes of temperature found in the continental climate are good. It grows best where the three month summer temperatures are 63° to 73°F

2. Well-distributed moderate rainfall is very good for sugar-beet cultivation. Rainfall should come in light showers throughout from June to August but the autumn, when it is harvested, should be dry and clear.

3. Well-drained fertile loamy soil is most suitable for sugar-beet cultivation. The soil must be deep and friable in order to allow full development of the root. Sugar-beet is an exhausting crop. Therefore, its soil requires manuring after three or four years.

Soils rich in lime are very good. Water should not stand on the sugar-beet fields.

4. During the growing period, wild weeds have to be removed from the sugar-beet fields. This work has got to be done by hand only because the plant is so small that only human fingers can save it from being destroyed by the wild growing weeds.

5. This naturally requires a lot of manual labour and it has been estimated that the labour required for one acre of sugar-beet is six times that for an acre of maize and 12 times that for an acre of hay. Women and children form the surplus labour force in the industrial regions of the temperate latitudes and supply cheap labour for sugar-beet cultivation.

6. Sugar-beet yields very much less sugar than sugar-cane and then, the work of extracting sugar from sugar-beet is seasonal—only lasting from October to January. Hence, in order to compete with cane sugar and in order to provide occupation to the farmer during the spare time, sugar-beet cultivation is carried on as a part of mixed farming. The beet cultivators domesticate animals and keep cattle because much of the sugar-beet refuse is a good cattle food.

7. Being a part of mixed-farming and depending upon the surplus women and child labour, sugar-beet cultivation is most advantageous near the great industrial regions of the world.

Regions of Production—The chief sugar-beet producing regions are situated in two distinct belts :—

1. *Central Plain of Europe* which spreads from Ireland to Central Russia and consists of north France and Belgium, Magdeburg region of Germany, Czechoslovakia and Russia.

2. *North Central U.S.A.* consisting of the States of Idaho and Utah.

In Europe, the greatest centre of sugar-beet cultivation is *Central Germany*. Here level plain has a vast expanse. The peasant children are employed to pull weeds and their mothers are seen ploughing in the beets. Magdeburg is the chief centre and river Elbe carries most of the beet-sugar produce in this region. *Russia* is the second largest centre of beet production and about 30 lakh acres of land are given to sugar-beet cultivation. 1/4th of the total world produce of sugar-beet comes from the U.S.S.R. and the average yield per acre is 7 tons. *Poland* and *Czechoslovakia* are now coming to third position.

U.S.A. is the only country which produces both sugar-cane and sugar-beet but sugar-cane is not utilized for sugar making. The two regions are widely apart and very much limited. Sugar-beet cultivation is carried on with the help of irrigation

from Montana to South Colorado. The U.S. beet sugar industry developed very late because of the scanty labour supply. It is, however, the chief cash crop for the American farmer where the climate is too cool for the development of maize cultivation. The newly arrived immigrants provide cheap hand labour on contract basis.

International Trade—The cultivation of sugar-beet and the work of making sugar from it is carried on in those regions, where population is dense, capital is in plenty, good tools and machinery can be used and there is a great demand for sugar. Therefore, beet sugar is mostly consumed in regions where it is produced and international trade therein is almost nil. Only Czechoslovakia, Poland and Hungary export some beet sugar.

CHAPTER VI

Agriculture—Beverage Crops

1. TEA

Conditions of Growth—1. The cultivation of the tea bush is usually kept down by pruning it to a height of 5 to 6 ft. so that the leaves may be picked by hand. If allowed free growth, the tree attains considerable size. Besides pruning, tea leaves are to be picked by hand. During the season there are 16 pickings in Assam, 4 pickings in China and 11 pickings in Ceylon. After the leaves have been picked, they have to be dried, prepared for the market and packed into cases. All this requires manual labour and therefore, it is necessary that cheap labour should be available on the plantations. That is why, we find that tea can only be grown with success in regions of dense population with its resultant low wage.

2. Even though the tea shrub is quite hardy, it is a sub-tropical plant. It requires a long, warm and moist growing period. A temperature of 70°F and a fairly good rainfall, well-distributed during the growing season is the most important requirement. It can even stand a somewhat frosty climate. That is why it thrives even in central China and the cotton belt of the U.S.A. but the best regions for its growth are the regions of monsoon climate where it is concentrated.

3. The tea plant requires a deep fertile soil. The soil must be very well drained because water should not stand in its roots. The tea soil requires occasional manuring and, therefore, recently cleared forestlands on hill-sides are excellent.

4. The tea shrub is ready in three years' time and a tea garden is usually the factory. Therefore, tea cultivation requires a lot of capital and scientific organization.

Areas of Production—The most important tea growing lands of the world are all concentrated in regions of monsoon climate, where the best conditions for its cultivation are found. China, India, Ceylon, Indonesia and Japan are the chief producers of tea. Recently tea cultivation has also been started in the countries of East Africa and in the Caucasus region of Russia. The South coast of the Caspian Sea in Iran also produces some tea, but

95% of the world production comes from South-East Asia. The monsoon climate, the dense population of monsoon lands and the fertile hill slopes are the greatest producers of tea leaves in the world.

China—China produces the largest amount of tea in the world, but the human consumption is so great that very little is left for export. Tea growing is a domestic occupation and cottage industry in China but because of excessive cold, only four pickings are possible. The Tibet region of China receives "*brick tea*" which is a speciality of China only. This type of tea is prepared by pressing the 12" twigs of the tea shrubs under the wrapping of rice paste. Hankow is the chief town of export and it goes mostly to Tibet and Russia.

India—India is very important as far as exports of tea are concerned. 45% of the world's demand is supplied by this country. North-east India, specially the Himalayan slopes and the slopes of Assam hills are the most important tea producing areas of the country. Nilgiri hills also produce some tea. Fertile soil, heavy rainfall, cheap labour, cheap water transport and nearness to the port of Calcutta have favoured the tea gardens of Assam and Bengal. Most of the tea gardens in India are controlled by foreigners.

East Pakistan also has a few tea gardens.

Ceylon is also an important producer of tea and about 4 lakh acres of high mountain slopes are under tea shrubs.

The *Indonesian* tea gardens are found in Java and Sumatra.

In *Japan* tea cultivation is carried on the Pacific Coastlands. The tea gardens are not very extensive but they are carefully looked after by the Japanese people. It is a garden crop and while for use at home, the tea is prepared by hand, machine is used for curing tea leaves meant for export. Japanese teas are mostly green and the U.S.A. is the greatest buyer of Japanese green tea.

Periodicity of Tea crops in Major Producing Countries

North India	Apr. Dec.
South India	Jan. Nov.
Pakistan	Apr. Dec.
Ceylon	Jan. Nov.
Indonesia	Jan. Feb.
Malawi	Jan. Sept.
Kenya, Uganda & Tanzania	Jan. Nov.
Portugese East Africa	Jan. Nov.

International Trade—The English speaking people of the world consume nearly 4/5th of the tea which enters in international

commerce. Russia comes next in importance, as the buyer of tea. The per capita consumption of tea is the highest in the U. K., Australia and New Zealand come next in importance. Tea is also very popular in Siberia and Persia. World tea consumption continues to decline against rising output, and ultimately lower prices. Britain, traditionally the world's greatest tea-drinking nation, last year reduced consumption.

Among the tea exporters, China, occupied a very prominent position upto the year 1840, but now it has got no place. 45% of the world's export comes from India. India, Ceylon and Java contribute 80% of the total tea exports. Recently, the domestic consumption of tea is on the increase in all these countries and, therefore, efforts are being made to grow more and more tea so that the export position does not suffer. London is the greatest distributing market for tea because Great Britain is the greatest consumer of tea. Recently, Canada and the U.S.A. have also begun importing tea.

One of the important contributory causes of this increased production, other than the weather, is the persistent efforts of producers throughout the world to extend their acreage and to rehabilitate the old and uneconomic holdings. This policy was to some extent necessitated by the need to bring down the cost of production and offer the teas at competitive prices. But it has also boosted production to such an extent that the additional weight of tea in the world market has begun to depress the prices all round. The situation, therefore calls for urgent action on the part of the producers.

2. COFFEE

Conditions of Growth—Like tea, coffee is a sub-tropical plant and requires a well-drained soil. But it is less hardy than tea.

1. The coffee plant requires hot climate and moderate rainfall. 70° F of average annual temperature and 60" to 70" of rainfall are ideal. Also, 75" to 100" rainfall does not harm the plant.

2. The coffee tree cannot stand more than light frosts and it has also to be protected from the direct rays of the sun. Generally larger trees are planted round the coffee plantation and the coffee tree is not allowed to grow more than 8 ft. in height. In some regions, early morning mists provide a natural protection from the sun's rays.

3. The best type of coffee grows in regions which are visited by sea breezes.

4. Coffee tree is liable to diseases and in the last century, the coffee plantations of Ceylon were absolutely wiped out. Therefore, great care is required in planting coffee only in those regions where it remains free from diseases.

5. Coffee requires fertile, undulating land where water does not stagnate or stand. The conditions limit coffee production to hills and islands. The gently rolling lava lands are also very good for coffee cultivation.

6. The coffee tree takes three to five years to mature and thereafter its berries can be obtained for a period of 30 years. The berries are picked twice a year, once in winter and again in the spring. This requires cheap labour in sufficient number.

7. The coffee plant is grown in the tropics while the regions of its consumption are temperate latitudes. Therefore, it is profitable to grow it near the seacoast so that it can be easily transported and cheaply exported.

Areas of Production—1. The *Sao-Paulo region of Brazil* in South America gives 74% of the world production. Brazil has been called the lord of the Coffee World. 2/3rd of the coffee is produced in just a small corner of this country. Coffee has long been a backbone of the export trade of Brazil but it also suffers from its dependence on only one crop. In years of slump when there is an excessive production, the Government has to purchase coffee stocks or excess coffee production is to be thrown away into the sea. Lava soil, abundant rainfall and excessive heat are the natural conditions present here. Coffee is grown in such huge plantations that several of them provide their own railways. Because of cheap land, cultivation is done carelessly and heavy rains also do great damage by washing away the soil. Rio de Janerio and Santos are the two great coffee ports.

2. *Carribean islands and Central America* produce 13% of the world's coffee. The island of Haiti is the greatest exporter of coffee from among the islands of West Indies. The highest priced coffee known as the "blue mountain coffee" comes from Jamaica. In Central American Highlands, coffee is the best money crop. The greatest bottleneck is, however, the ruggedness of the land and the high cost of transport. Guatemala and Salvador are the most important.

3. After the second world war, *Africa* has come to occupy a very important position among the producers of coffee. Abyssinia, Belgian Congo, French West Africa, Madagaskar, Uganda and Angola are the most important areas producing coffee in Africa. African coffee is exported to Europe and the U.S.A. 80% of the coffee grown here is of the *robusta* variety. During the last 7 or 8 years, coffee production in Africa has increased by 70% and 18% of the total world produce comes from Africa. As the domestic consumption is very little, almost the whole produce is exported and Africa contributes 20% coffee of the international trade.

4. *Indonesia and India-Ceylon—Java* is a very important area of coffee production. Coffee industry in Java was encouraged by the Dutch settlers as it was encouraged by the British Govern-

ment in India and Ceylon. *India* and *Ceylon* are other important producers in Asia. Indian coffee comes from the Nilgiris and Annamalai Hills of South India and it is exported to U.K. and France. Coffee growing was very important on the moist highlands of Ceylon but was ruined by the spread of disease.

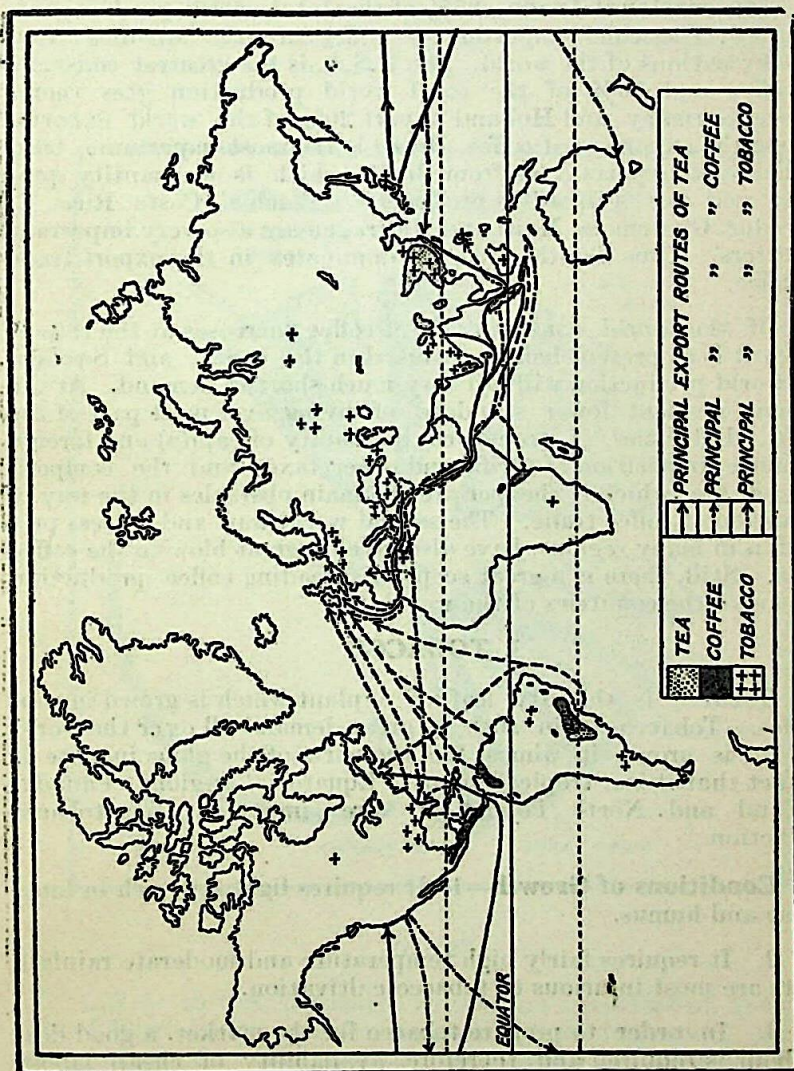


Fig. 22

5. *Mocha Region of Arabia* is one of the best place for the growth of coffee. Here the shade loving coffee tree has the advantage of mists which protect it from the direct rays of the sun. Mocha coffee is well-known all over the world for its fine quality and flavour. It is carefully prepared and in Yemen it is a cash

crop. The natives do not use it at all and it is exported through the port of Aden. Difficulties of irrigation, bad roads, heavy taxes and defective Government are the main reasons for the low yield of coffee. Even then, it is liked all over the world for its good quality.

International Trade—85% of the total world production is exported. The chief importers of coffee are the advanced and wealthy nations of the world. The U.S.A. is the greatest consumer of coffee and 50% of the total world production goes there. France, Germany, and Holland import 20% of the world exports. Among the exporters of coffee, Brazil is the most important. 60% of the world exports come from Brazil, which is a quantity producer and not a quality producer. Colombia, Costa Rica, E. Slavador, Guatemala, Haiti and Nicaragua are also very important exporters. Thus South America dominates in the export trade of coffee.

If the world consumption of coffee increases at the rate at which it is at present being consumed in the U.S.A. and Sweden, the world production will fall very much short of demand. At the present moment lower standard of living over most part of the world, difficulties of transport, instability of capital and foreign exchange, imposition of tariffs and other taxes and the competition of tea which is cheaper are the main obstacles in the way of expansion of coffee trade. The second world war and excess production in many regions, have also given a great blow to the coffee trade. Still, there is a great scope of spreading coffee production in some of the countries of the world.

3. TOBACCO

Tobacco is the dry leaf of a plant which is grown in sub-tropics. Tobacco is in such a great demand all over the world that it is grown in almost all the parts of the globe in spite of the fact that it is a tropical plant. Equatorial regions, Canada, Scotland and North Poland all are important for tobacco production.

Conditions of Growth—1. It requires light soil, rich in lime, potash and humus.

2. It requires fairly high temperature and moderate rainfall. Frosts are most injurious to tobacco cultivation.

3. In order to prepare tobacco for the market, a good deal of labour is required and, therefore, availability of cheap labour in sufficient number is very essential.

Areas of Production—The chief countries producing tobacco are U.S.A., India, China, U.S.S.R., Japan, Philippines, Indonesia, Brazil, Pakistan, Bulgaria and Turkey. Countries of Central and Western Europe also produce tobacco.

World tobacco production in 1969 is was 45 million metric tons. Output is at the same level as in 1968 but is 4.4 per cent lower than the record output obtained in 1967. Output in North America went up by 6.6 per cent and South America by 8.1 per cent in 1969. Output in Europe declined by 5.4 per cent, in Asia by 4 per cent and in Africa by 0.8 per cent. The crop in Australia and New Zealand was up by one third. The 1969 production continues to be above domestic and export requirements. In Asia, India's crop has been smaller.

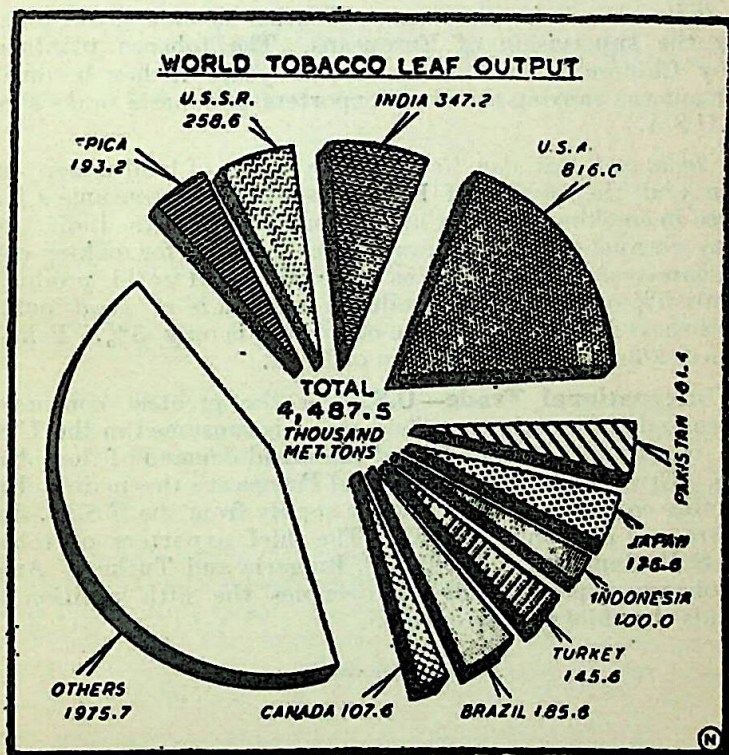


Fig. 23

U.S.A.—In U.S.A. tobacco cultivation is carried on with the help of Negro labour and it occupies the most important position among the producers of tobacco. 25% of the total world production comes from this country and the states of North Carolina, Kentucky, Virginia, Tennessee, South Carolina, Georgia, Pennsylvania, Wisconsin and Ohio are the most important tobacco producing areas. 50% of the U.S. production comes from central Carolina.

China—29% of the world production comes from China. Central and north-eastern regions are the most important for its cultivation.

West Indies—West Indies, specially *Cuba*, produces high quality tobacco. This is in great demand all over the world because of its excellent flavour. Havana is the world centre for cigars. Cuba exports a lot of tobacco leaves as well as manufactured cigars. 40% of total production is exported as leaves. Tobacco is grown mainly in the Vuelta Abajar district.

Indonesia—Java, Sumatra and other islands grow tobacco under the supervision of Europeans. The tobacco plantations employ Chinese labour and in recent years it has become so important that among the world exporters, Indonesia ranks second after U.S.A.

India and Pakistan have a large extent of land under cultivation and the people of both these countries consume a lot of tobacco in smoking, chewing and as snuff. In South India, good quality virginia tobacco is grown which is useful for making cigars and cigarettes. India produces 9% of the total world production but only 5% of the tobacco produced in India is of good quality. India's share in the world trade of tobacco is only 5%. Pakistan produces 2/3rd of the production of India.

International Trade—U.S.A. is the greatest consumer of tobacco and 20% of the world's demand is consumed in the U.S.A. India comes next where 7% of the world demand of the tobacco exists. Great Britain, Germany and France are the main tobacco importing countries. U.K. gets its supply from the U.S.A., Java, Sumatra and Philippine Islands. The chief exporters of tobacco are U.S.A., Sumatra, Cuba, Brazil, Bulgaria and Turkey. Among the tobacco exporters, Brazil, occupies the fifth position and Balem is the chief port of export.

CHAPTER VII

Agriculture—Industrial Crops

1. JUTE

Jute is, by far, the cheapest fibre in the world. It is used in making several types of things, the most important being ropes, canvas, sacks. The great demand of jute in the world market is due to the fact that jute bags are very popular for filling in agricultural produce. Even though many other fibres have come in use, there is hardly any other fibre which is so cheap and so comprehensive in its utility.

Conditions of Growth—1. Jute is a tropical plant and requires high temperature and heavy rainfall. 88° F temperature and about 80" of rainfall is excellent for the cultivation of jute. Rainfall must be well-distributed and there must also be ample sun-shine in the early stages.

2. Jute is a very exhausting crop and, therefore, it requires highly fertile soil. The best quality of jute is produced in loamy soils but the greatest quantity is produced from clay soils. Delta and flood plains are the most important regions of its growth because the soil fertility is replenished every year by means of a fresh layer being laid up.

3. The cultivation of jute is a very strenuous process. The land has to be ploughed and harrowed much more carefully than in any other variety of agriculture. Then it has to be retted in water and beaten so as to yield fibre. All this requires hard work and therefore, it requires cheap skilled labour in sufficient number.

4. In order to put the plant in water and then beat it, one often requires a large number of reservoirs containing clean water. The water must be neat and clean and in sufficient quantity, otherwise the fibre might get dirty in the process.

5. Jute is a raw material which has to be processed in the factories. Therefore, cheap means of transport between the market or the manufacturing centres and the producing centres is very essential.

Areas of Production—These conditions of growth are found in India and Eastern Pakistan and that is why we find that practically all the jute supply of the world comes from these two countries. Behind Pakistan and India, Brazil is the third largest producer of Jute and Mesta (kenaf), in both instances a distant third. Small quantities of Jute are also produced in Formosa, Congo, Thailand, Cambodia and Vietnam. Egypt, Iran, Siam, Japan, Mexico and Uruguay can also practise jute cultivation with success. In 1966-67, world production was 1850 million lbs., 11.3 per cent above the 1965-66 out turn and 7.2 per cent above that of 1964-65. 99% of the world jute comes from Pakistan and India—60% from Pakistan and 39% from India. 1/2 of India's jute is manufactured into gunny bags. But the modern tendency is to discard the use of gunny bags for filling in agricultural produce. Hence the jute industry has now begun to produce carpets, cloth and even dhoties. Outside India, the chief manufacturing region of jute is situated at Dundee in Scotland. Calcutta region in India and Dundee region in Scotland are thus the most important manufacturing centres of jute. Philadelphia in America also manufactures jute.

International Trade—Jute is of great importance in the International Trade. Jute is exported mainly from Pakistan and to a little extent from India. The chief importing countries are India, Great Britain, U.S.A. and Germany. Manufactured jute goods are exported from India and Scotland. The chief importers are Australia, Argentina, South Africa, Japan, France and Italy. Now-a-days, the jute fibre is also being used as an insulating material but there is a great uncertainty in the trade because every country in the world is trying to produce its own fibre and in that direction, it wants to be self-sufficient. The use of paper bags, cloth bags, etc., has been generally responsible for a decline in its trade. However, none of these things have the quality of being re-used or being used again and again as is the case with gunny bags. Therefore, gunny bag as a packing material is still regarded as almost indispensable.

2. COTTON

Cotton is the fibre from which we manufacture cloth and among the cloth making fibres it occupies the most important position. Cotton is a sub-tropical crop which grows best in regions where a variety of climatic, soil and economic conditions are found.

Conditions of Growth—1. It requires a long, warm and moist growing period. In the growing season, it needs plenty of moisture a hot moderately damp but not saturated atmosphere with frequent showers. This type of weather should continue until the flowers have been formed. Thereafter it requires a dry sunny period till the bolls ripen and burst and the cotton can be gathered. A bright sunny weather in the picking season is very essential.

2. The frost is most injurious to cotton cultivation. The date of planting of the seeds is determined by the last killing frost of the spring and it should be gathered before the killing frost of autumn.

3. Cotton requires 240 frostless days or a little over six months. These conditions are generally found in warm temperate oceanic climate, both the Gulf type and China type, as well as in the drier parts of Monsoon and Tropical climate.

4. It requires a fertile, light-drained soil. If the soil is capable of retaining moisture, it is very good. That is why we find that the black cotton soil of India has been so suitable for cotton cultivation.

5. Cotton is an exhausting crop and, therefore, after a limited number of years, manuring or a carefully regulated crop rotation becomes essential.

6. The cotton plant is very much liable to diseases. Therefore, very careful measures are required to keep it in check. Humid farming generally brings about a number of insect pests which destroy the cotton crop. Therefore, its production has been adapted to dry farming.

7. The picking of cotton has to be done by hand and even though great effort has been made, machinery has not been successful. Therefore, in the picking season, there is a great demand for labour and availability of cheap labour in sufficient number is an essential factor for the success of cotton cultivation.

8. Recently, great reduction in cotton price and the increase in demand has brought a new economic factor into prominence *i.e.*, cheap extensive land. Now the cotton growing areas are being shifted from the populous areas to the broad extensive empty lands where with the help of scientific methods, its cultivation can be carried on.

These are, then, the climatic and economic factors essential for cotton cultivation. The frostless season of 200 days, an adequate supply of moisture in the growing period, an abundant sun-shine in the picking season together with cheap labour or cheap land and consistent with the fertility of the soil, determine the region where cotton cultivation can be carried on. As a matter of fact, cotton cultivation has now been widely adapted to different climatic conditions in both the hemispheres and the planting and picking of cotton is going on almost every day of the year in one or the other part of the world.

Varieties of Cotton and Yield—The yield of cotton varies from place to place and the highest yields are obtained where the climate is dry and the ravages of cotton pests like the *boll-weevil* are not very serious. Besides freedom from pests and diseases the

yield of the cotton crop depends upon the varieties grown and the length of the picking season.

1. The best cotton is that which has a staple length of 1.5" to 2.5". This is known as the *long staple cotton*. The long staple cotton is grown in the West Indies and Egypt. It is often known as the Sea Island Cotton. Sea Island Cotton has a long, thin, silken staple. Its plant is grown on lowland and it was first cultivated in South Carolina, Florida and Georgia States of the U.S.A. This is also known as long staple cotton. But very small quantities are produced now. This variety of cotton is in great demand for the manufacture of those fabrics where lightness and strength are required. Parachute cloth has a special demand for this type of cotton. At the present moment, commercial farming of this variety is limited to Puerto Rico and other islands of the West Indies. Total annual production is hardly as much as 10,000 bales. This cotton is very much susceptible to '*Bollweevil*' which was responsible for the destruction of the cultivation of this variety in south-east U.S.A.

2. *Medium staple cotton* has staple length of 1" to 1.5". The medium staple cotton is the most important variety in commerce. It is also known as American cotton and it is grown over more than 90% of the area devoted to cotton cultivation in the U.S.A. It yields white and strong staple and the Mississippi land is the most important for this cultivation. Egyptian cotton is also of this variety.

3. The *short staple cotton* has staple length of less than 1". The short staple cotton is only grown in Asia, while the American cotton is of medium staple. Short staple cotton is normally grown in areas of heavy rainfall. India and Brazil are the producers of short staple cotton. It yields short coarse staple and it is required for manufacturing coarse fabrics or for mixing up with better quality cotton. This is also known as the East-Indian cotton.

4. Besides these, there is a fourth variety also which is yielded by the woody trees of South America. This tree is 10 to 15 ft. in height and yields fruit for 10 years or more. *Tree Cotton* is grown in Peru and yields a strong but rough staple which is very much similar to wool. This is best for mixing with wool, and the woollen hosiery industry often has a great demand for this type of cotton.

Areas of Production—The most favourable conditions of growth favouring cotton cultivation are found between 43°N and 33°S latitudes excluding the equatorial belt. The limits of commercial cultivation of cotton is determined by the isothermal line of

60°F. The long staple cotton is grown on the islands or on lands near the sea. The U.S.A. ranks first among the cotton producers of the world. India, China and U.S.S.R. come next in the importance. Brazil, Sudan, Iran, Mexico, Peru, West Africa, Uganda. Egypt and Pakistan are other important producers of cotton.

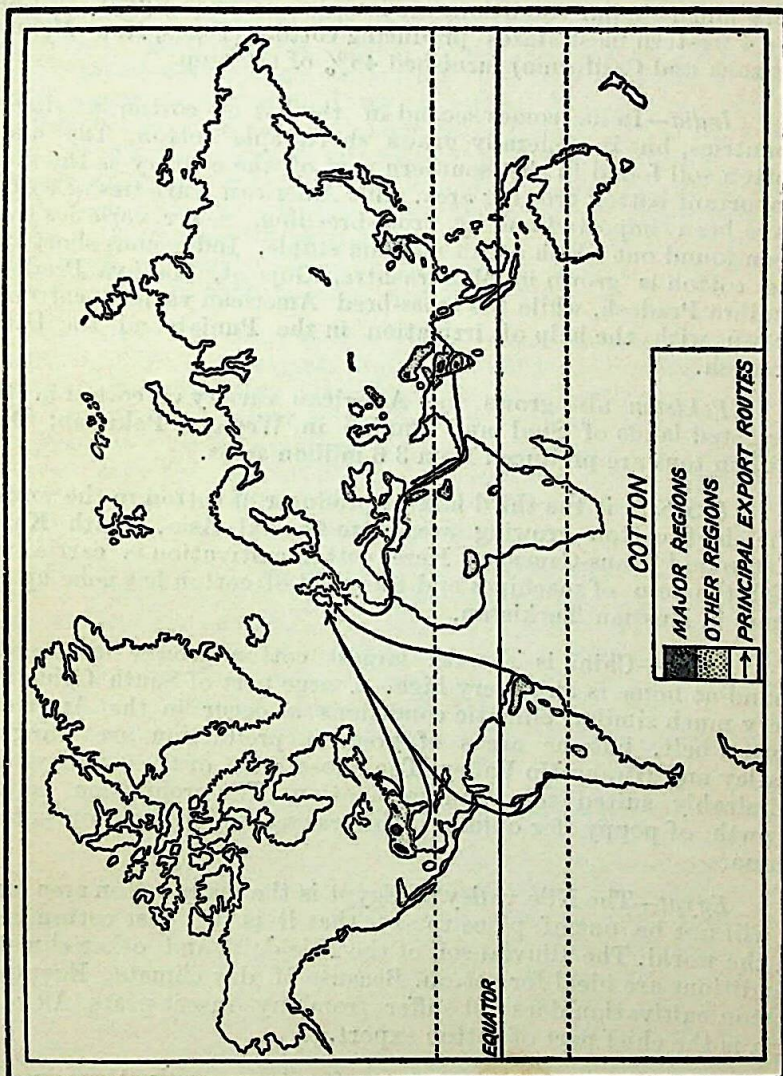


Fig. 24

U.S.A.—U.S.A. produces about 45% of the world's cotton. The chief regions where cotton is prominent are Texas, alluvial land to the east of Mississippi and the States of Georgia and Carolina. But the cotton cultivation has suffered very much due to

cotton boll-weevil. In all these areas, both long staple and medium staple cotton is grown. The limit of cotton cultivation in the U.S.A. is determined in the north by 77°F Isotherm and in the west by 23° Isohyet. By mixed breeding, a special variety of cotton has been discovered which is grown in California and Arizona, where very much similar conditions are found as occur in Egypt. In 1968, the 4 western most states producing cotton (Texas, New Mexico, Arizona and California) furnished 48% of the crop.

India—India comes second in the list of cotton producing countries, but it generally grows shortstaple cotton. The black cotton soil found in the southern part of the country is the most important cotton growing area. But American varieties of cotton have been imported and by cross-breeding, newer varieties have been found out which are of medium staple. Indigenous short staple cotton is grown in Maharashtra, Gujarat, Madhya Pradesh, Andhra Pradesh, while the cross-bred American variety cotton is grown with the help of irrigation in the Punjab and the Uttar Pradesh.

Pakistan also grows the American variety of cotton in the irrigated lands of Sind and Punjab in Western Pakistan; 0.41 million tons are produced from 3.6 million acres.

U.S.S.R is the third largest producer of cotton in the world. The chief cotton growing areas are Central Asia, South Kazakhstan and Trans-Caucasia. Here cotton cultivation is carried on with the help of machines and the yield of cotton has gone up six times in Russian Turkistan.

China—China is the 4th largest cotton grower but the demand at home is also very high. A large part of South China has very much similar climatic conditions as occur in the American cotton belt, but the areas of greatest production are Yangtze Valley and Hwang Ho Valley. The loose soils of these valleys are admirably suited to cotton cultivation. The prohibition on the growth of poppy for opium is increasing the cotton output of China.

Egypt—The Nile valley of Egypt is the main cotton area and it will not be out of place to say that it is the best cotton field in the world. The alluvial soil of the Nile delta and other climatic conditions are ideal for cotton. Because of dry climate, Egyptian cotton cultivation does not suffer from any insect pests. Alexandria is the chief port of cotton export.

West Africa—An assessment of cotton production in the independent countries of former French Equatorial Africa, and French West Africa just released here by the Foreign service of the U.S. Department of Agriculture indicates the great progress achieved among the cotton producers of that part of the world, Chad and Cameroons being the most important.

The countries comprising former French West Africa have shown a significant increase in cotton production in recent years. Yields tend to be low in Central Africa because of the humid climate and insect problems.

East Africa—At the instance of the British Cotton Mill Owners, cotton cultivation has been extended to suitable lands in East Africa. North Nigeria, former Nyasaland, Tanzania, Uganda and Kenya are developing as important cottonlands. *Sudan* is also a very important cotton producer in Africa. As a matter of fact, the story of the economic development of *Uganda* is the story of development of cotton cultivation there. At present, Uganda contributes 2% of the cotton production of the world. Congo region in Africa has also been growing cotton and there are ample opportunities of increasing its production. Kenya and Tanzania have plans afoot to expand irrigated output of cotton. Tanzania produced about 2,75,000 bales of cotton per year.

Uganda is well down in the World Cotton League, though it is normally the third biggest producer in Africa after Egypt and the Sudan. But exporting virtually all its output, it is surprisingly in the top ten in the export league which consists these days of more than 70 cotton producing countries, large and small. More important than this feature is that cotton forms one of Uganda's two main export items; the other is coffee which in the past year or so has gone through a crisis of depressed prices.

Cotton accounts for 28 per cent of Uganda's total export revenue, second only to coffee which earns well over half the country's foreign exchange. Furthermore cotton is grown like coffee not on large estates with the financial resources to weather the odd price storm but predominantly on peasant small holdings. All in all it, is estimated that some 2-1/2 million people, over a third of the population, often including whole families are engaged in growing cotton.

In *South America*, Brazil, Argentina, Paraguay and Bolivia have great possibilities of extending cotton cultivation. In *Brazil*, imported cotton varieties are grown in Sao Paulo and tree cotton in Caera, but still very great possibility exists. The chief difficulties are lack of capital and labour and uncertain political conditions and the most unsatisfactory methods of handling the crop. In *Peru*, though the conditions for handling and marketing the crop are much superior, the trade and cultivation of cotton is concentrated in the hands of a few Europeans. Then there are no extensive lands. Some cotton is grown here as an irrigation crop on the arid Coastal plain but half of the total production is the native tree cotton.

Queensland in *Australia* has a large cotton land and the Government has now turned its attention to this region. The fact is that there is a lot of potential cotton land in the southern

hemisphere and it is bound to yield good results if it is properly developed.

International Trade—Cotton is the chief commodity of International Trade and has a very great importance. The chief importing countries of cotton are Great Britain, Japan, Germany, France and Italy. Japan is the greatest importer of cotton. The largest source of world's raw cotton is still the U.S.A., India and Egypt are also important exporting countries. Pakistan is also developing as a supplier of cotton. The U.S.A., Japan and Great Britain are the countries which import cotton from India. Egyptian cotton goes to China, India and Great Britain. U.S.S.R. also exports some cotton but mostly to the countries of the Eastern Europe. Recently, there has been a marked increase in the export of cotton from Brazil and Argentina. The East African countries are also important suppliers of cotton to the countries of the Commonwealth.

Recently, there has been a great change in the relationship of the exporting and importing countries. Formerly, the countries of Asia and Africa used to export their cotton but now in every cotton growing country, textile industry has been or is being set up. As such there has been a greater demand at home with the consequent reduction in exports. This has resulted in the importing countries trying to find new avenues for their supply. Emergence of South American countries as suppliers of cotton has to be understood in this context. Another tendency in the international trade has been that those countries of the world which were, a few years back, the exporters of cotton, have now begun to import cotton from other countries.

The level of world cotton consumption is rising despite depressed textile markets in West Europe and the curtailment of textile production in Japan. In the U.K., mill consumption of cotton has declined to the lowest level of this century.

3. RUBBER

Rubber is the sap of a wild tree which on coagulation takes such a form that with its help we can erase our writing in pencil. The wild tree is found growing in the Equatorial forests of Amazon and Congo basin. Columbus was the first to discover the natives using it for balls and ornaments. Later on, it came to be used for making crude water-proof clothing. Thereafter, it continued for a very long time as an eraser. But with the coming of the bicycle, motor car and electrical engineering industries, the utility of rubber was widely acknowledged and the attention of the world was attracted towards the sources from which rubber could be obtained. Now-a-days, rubber is used for making a large number of things including tyres, tubes, shoes, sports-goods, waterproof clothes etc.

Conditions of Growth—1. Rubber tree requires heavy rainfall, well distributed all the year round. 80" of annual rainfall is necessary for this. It also requires a temperature of about 80° F all the year round.

2. Deep, fertile and loamy soil is the best for rubber cultivation. The soil should be well-drained and water must not stand on it.

3. Collecting rubber and preparing it for the market is a process which requires a good deal of labour, and, therefore, it is essential that cheap labour in sufficient number must be readily available.

Areas of Production--Under the conditions given above, the rubber tree grow wild by itself in the equatorial regions, which are the most suited for rubber cultivation. But it is also cultivated on plantations and their production is much more and much better than that of the wild forest. The *wild rubber* comes from Brazil, Colombia, Venezuela and Belgian Congo. As a matter of fact, till 1898, all the production of rubber came from these sources only. But collection of wild rubber is a very difficult process and then this wild rubber usually contains about 25% undesirable substances. In 1900 the total world production of rubber was 54,000 tons but only 4 ton was produced in plantations.

Plantation Rubber—The need for planting rubber was felt when the need of rubber for the automobile industry went on growing and the supply of crude rubber from forests continually declined. This position necessitated rubber culture. Financed by the British capital and worked by Chinese coolie labour, rubber plantations were established in Indonesia and Malaya. Rubber plantations are found in India and Ceylon also. Because of scientific process and rational management, *plantation rubber* is now more important than wild rubber. It is so carefully prepared that hardly 3% dirt or filth gets into it. The result has been that now-a-days 95% of the world production of rubber comes from the rubber plantations of Indonesia, Malaya, Ceylon and India. Indonesia and Malaya are the most important regions for rubber plantations, Indonesia being the first in the world. In Malaya which ranks second, there is about 33 lakh acres of land under rubber plantation and 20 to 50 lakh people depend upon this for their means of livelihood. But these plantations are all owned and managed by foreigners. Plantation rubber is usually of more even quality and the curing is better than that of the forest smoked product. Then the carefully tended plantations are also quantity producers. Because of these two factors, the rubber market of the world has now shifted from Para to Singapore.

Malaya, Indonesia, Siam and Vietnam account for about 80 percent of the world production of natural rubber, Ceylon produces 5 per cent and India 2 percent of the world output. Other countries make up the balance.

Plantations can be started with care in the northern States of the Amazon basin where all the natural factors are available. Brazil and Peru are also potential areas for rubber plantation but because of the shortage of cheap labour and a long dry period, the work has not gone ahead with any great speed. Some possibilities also exist in the Congo basin and the Ghana area of Africa.

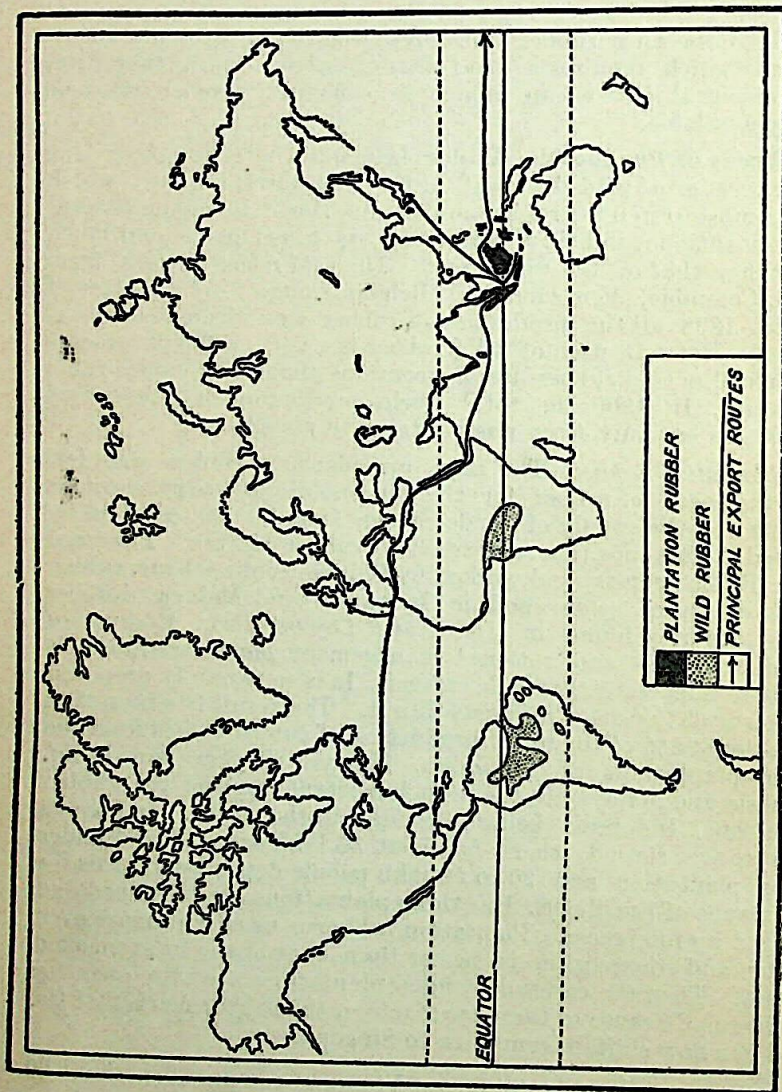


Fig. 25

But the chief drawback of these regions is that it is full of pests and insects, which harm the growth of rubber tree. In certain areas of temperate latitudes also, rubber cultivation can be adopted.

The rubber producing Tucking tree of China is very well adopted to U.S.A. and has been experimented near Boston. Some other varieties have also been tried in the southern states of the U.S.A. and North Mexico. There are possibilities of extending rubber plantation to the cotton growing states of the U.S.A. and West Indies. There the climate is free from frosts, cheap skilled labour is abundant and there are good means of communication. In Europe, some effort to grow rubber has been made in Germany and Poland while great advance have been made in Russia where the cross-bred varieties has been found suitable in North of the Caspian Sea and in Western Ukraine.

International Trade—A very great demand for rubber exists in the countries of Europe and U.S.A., where rubber consuming industry has developed the most. The U.S.A. alone imports about 2/3rd of the total world production. After this comes U.K. The demand for rubber is also increasing in the U.S.S.R. At present the chief rubber importing countries are, in order of importance, U.S.A., U.K., France, Germany, Canada, Japan and the U.S.S.R. 95% of the world supply comes from Malaya, Indonesia and Ceylon.

4. OIL SEEDS

Vegetable oils are derived from three sources, namely (1) **Oil-seeds** like linseed, rapeseed, cotton seed, sesame, soyabean (2) **Oily fruits** such as olive, palm and (3) **Oil nuts**, like groundnuts, coconuts. Of these three sources oilseeds contribute most largely to the production of oils.

Areas of Production by Types—The chief countries that produce oil-seeds in the world are :—

Countries	Average Annual Production (in million tons)
India	8
China	7
U.S.A.	4.5
Argentina	2
Nigeria	1
Indonesia	1

Groundnut is a native of Brazil and is grown both in the tropical and Subtropical regions of the world. Groundnut has a growing period of 200 days. During the growing period it requires high temperature and much rainfall. Some varieties mature in 140 days. The crop is sown in the months of May to August and harvested in the months of November to January. After the growth the fruit automatically pushes itself into the earth where it ripens. The upper layer of the soil must be soft so as to allow the penetration of the delicate flower plant. The groundnut plant enriches the soil for other crops. Friable sandy loam soils are essential for the development of crop underground. When ripe, the pods are dug out of the earth. Groundnuts are eaten directly

by human beings. They also yield edible oils and lubricating oils. They are also used for the manufacture of margarine and soap. Oil cake is fed to the cattle.

Monsoon climate is most suitable for the cultivation of groundnut. The chief groundnut producing countries of the world are India, China, Senegal, Portuguese, Guinea, French Guinea, Nigeria, Gambia. French West Africa, Uganda, Kenya, Tanzania, Rhodesia, Indonesia and the U.S.A.

Linseed is merely another name for Flax-seed. Flax plant requires cool and moist growing season. Excessive moisture is, however, harmful to the crop. It requires a rainfall of less than 30 inches. Flax is a winter crop in the Tropical and Subtropical regions and spring crop in the Cool Temperate regions of the world.

Argentina, India, U.S.S.R., U.S.A. and Canada are the principal producers. Argentina is the chief producer with 44% of world average, 64% of world production and 98% of its total crop going in the world export market. Russia consumes all its production while U.S.A. and Canada have to import linseed from abroad.

Sesame Seed is an annual plant thriving in the tropical and subtropical parts of the world. Of the world production of 1.5 million tons, the share of different producers is as follows :

India	33%	;	Mexico	20%
Sudan	15%	;	Kenya, Uganda and West Africa	20%
Burma, Pakistan and Turkey	12%			

India, China, Sudan, Mexico and Turkey are important exporters, while Japan, Italy and the U.S.A. are leading importers. 70 per cent of the exports comes from countries of Africa. Sesame oil is used as a lamp oil, cooking medium, in making soap and margarine butter.

Castorseed—The castor plant requires warm climate and a fair amount of rainfall after sowing. After the plant has germinated, much moisture is not necessary. It may be cultivated in all areas where maize can be cultivated.

Castor oil is used in the preparation of soluble oils of textile industry, in the manufacture of synthetic resins, in the preparation of leather, linoleum, paints, varnishes, and lacquers, for medicinal purposes as an illuminant, and a lubricating oil for aircraft. As a lubricant for aircraft it derives its value from the fact that it does not freeze even at low temperatures. Castor cake is used for manuring sugarcane and tea. It is not used as feed for the cattle.

Brazil and India together account for about 75% of the total world production but Brazil's production is $1\frac{1}{2}$ times that of India. Mozambique and French West Africa are the other producers. U.K., Italy, Belgium and France import castorseed or castoroil from India while the U.S.A. market has been completely captured by Brazil.

Rapeseed thrives both in the tropical and temperate regions on moist and rich loamy soil. It can flourish in all areas which are fit for the production of turnips and cabbages. 80% of the world supply comes from India ; Japan, China, Rumania and Poland being other producing countries. The international trade is very meagre.

Chief Exporters

Chief Importers

India, Rumania and China. Germany, France, Great Britain, Belgium, Netherlands and Japan.

Coconut—Dry and dissected kernel of coconut is called copra. The kernel of the coconut contains oils which is used for cooking purposes and vegetable butter. The fresh kernels are used for edible purpose. The milky fluid inside the fresh coconuts provides a refreshing drink. About 45% of the total production of nuts is utilised for making copra and the rest is used for edible and other purposes.

The chief world producers and suppliers of coconuts are the Philippine Islands, Indonesia, Oceania, Malaya, Ceylon, Zanzibar and Mozambique. Small producers are Australia, West Indies, Mauritius, Fiji, Kenya Colony, Gold Coast and India. Ninety per cent of the crop is raised in Tropical Asia and Oceania.

Philippine, Indonesia and Ceylon are the chief exporters of copra and coconut oil, Philippine alone accounting for 40% of the total export. West Germany is the largest importer of copra cake and meal. It gets 70% of the world exports. Denmark and Sweden account for the rest. 78% of the world production is exported.

Olive is a fruit grown in mediterranean regions and its oil is used for cooking, making salads and in spinning, weaving and soap making. Italy and Spain are the main producers while the principal exporters of olive oil are Spain, Turkey, Tunisia and Italy.

Cottonseed is obtained by ginning raw cotton and it is produced in all areas where cotton is cultivated. Cottonseed is valued for its oil, which is used in cooking, the preparation of vegetable fats and as a substitute for olive oil. Cotton seed cake is fed to the milch cattle. U.S.A., India, U.A.R. and Brazil are large producers of cotton seed. The chief exporting countries are Nicaragua, Nigeria, Syria and Turkey.

Palm Oil—Despite the record level of Malaysian output, little change appears to have taken place in world palm oil production since Nigerian commercial purchases fell by about a fifth. This reduction also led to a fall in world output of palm kernels. Some improvement in the output of these commodities may, however, take place now.

Soyabean grows where cotton and maize are cultivated. Sown in summer it is harvested in December. U.S.A. is the biggest producer in the world and soyabeans rank fourth in U.S. farm production. China (Manchuria) and Indonesia are other major producers besides the smaller ones like Japan, Brazil and Korea.

Beans supply oil, meal, green and dried beans. The U.S.A. handles 70% of the world export trade.

Main Exporters

U.S.A., Canada and Brazil.

Main Importers

France, West Germany, Japan, Canada, U.K.

International Trade in oilseeds dates back to the 17th century. First of all, the European countries imported oilseeds for the production of oils and later on other countries began to import oilseeds. The world demand for oilseeds has increased by leaps and bounds.

1. Owing to scarcity of butter, oilseeds are being increasingly used for the manufacture of edible fats.

2. Large quantities of oil are being used for the manufacture of soap and glycerine.

3. Rapid pace of industrialisation in the world has increased the demand for lubricating oil.

4. Paint and varnish industries use large quantities of dry oils such as, linseed oil, poppy seed oil, etc.

5. Countries of north-western Europe annually import huge quantities of oil-cake for their dairy cattle.

World actual net exports of oilseeds, oils and edible fats during 1968.

Commodities	Oilseed	Oil	(Total) as oil
		(Qty. in lakh metric tons)	
Soyabeans	87.43	4.36	20.10
Cottonseed	3.18	1.51	2.02
Groundnuts	15.53	4.25	11.08
Sunflowerseed	5.54	9.32	11.76
Rapeseed	7.57	1.38	4.33
Sesameseed	1.78	—	0.84
Olive Oil	—	1.42	1.42
Total	121.03	22.24	51.55

CHAPTER VIII

Forestry—Lumbering

1. TYPES OF FORESTS

All over the surface of the globe, one or the other form of vegetation is found. Even in the hot deserts and snow-bound lowlands, some form of vegetation is definitely found. The type of vegetation depends upon temperature, rainfall, winds, light and soil. In areas where there is heavy rainfall all the year round, or in areas, where the quantity of rainfall is less but the loss of moisture by evaporation is also little, forests are found. Forests are close formation of trees growing together at one place. The true forest is that in which trees are found so close to one another that their tops touch each other. If the trees are scattered over a large area and in between are found shrubs, it is known as *Bush-wood*. In case the number of trees are less in number than the shrubs, the area is known as *Shrub-wood*. Normally, forests are found in areas having 50° F temperature during summers and an average annual rainfall of more than 20 inches.

The forests of the world extend from the Equator to the poles even beyond the grain limit of the Arctic circle. These forests may be classified in several ways. According to the area or the region where they occur, they may be called *tropical forests* and *temperate forests*. On the basis of the quality of the timber, they are *hard-woods* and *soft-woods*. On the basis of their leaves, they are known as *broad-leaf* and *needle leaf* or *coniferous*. Then in some forests, trees shed their leaves in the dry season while in others they remain green all the year round. This is another basis for the classification of forests and they are known as *deciduous* and *ever-green*. Hard-wood forests are both deciduous and ever-green. Soft-woods are only ever-green. The hard-wood forests are found both in the temperate and tropical regions. Similarly, ever-green forests also occur both in the tropics and in the temperate latitudes. Therefore, there can be another division as *temperate hard-woods* and *tropical hard-woods*; *temperate ever-green forests* and *tropical ever-green forests*.

Extent of the Forests—One-fourth of the total area of the world is covered by forests and their greatest extent is found in

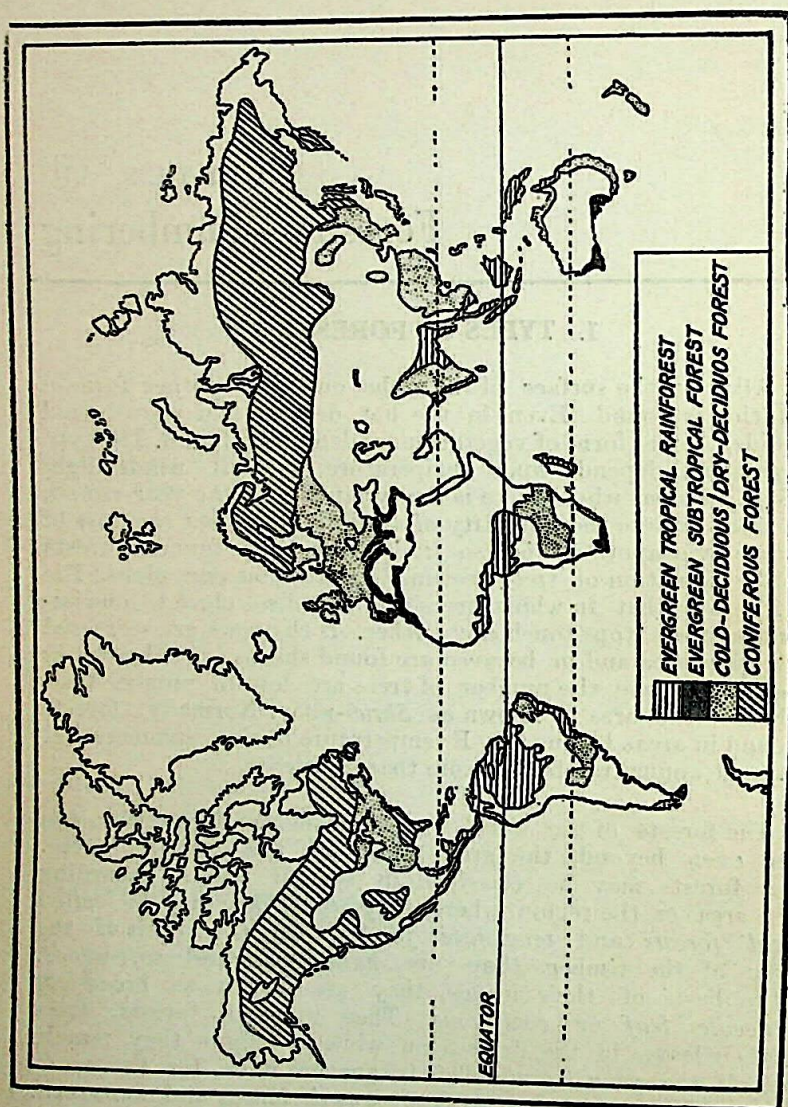


Fig. 26. Types of Forests found on the surface of Earth.

Asia and South America. The percentage of the total area covered by forests in different continents is given below:

Asia	...	...	22%	Africa	...	...	11%
South America	...	...	44%	Europe	...	...	31%
North America	...	...	27%	Oceania	...	...	15%

The forests found in different parts of the world are generally of the following three types :—

1. Tropical rain-forests or broad-leaf, hard-wood, ever-green forests.
2. Monsoon Forests or broad-leaf, hard-wood, deciduous forests.
3. Coniferous forests or soft-wood, needle-leaf, ever-green forests.

The aforesaid three varieties of forests occupy 49%, 16% and 35% of the total forest area of the world respectively.

Tropical Hard-Wood—Ever-Green Forests—In the Equatorial regions of the world, there is high temperature and heavy rain-fall throughout the year. Therefore, in this region which includes Amazon basin, Congo basin, Indonesia, East Africa and the wetter areas of monsoon regions, ever-green hard-wood forests are found. The trees are high, branches are inter-twined by means of creepers and the ground is over-laid with decaying vegetation. They have broad leaves and their wood is hard. Teak, Mahogany, Sandal, Cane, Rubber, Ivory, Ebony and Rose-wood are the most important trees found. These forests are also known as *Selvas*. Besides hard-wood timber and rubber, several types of gums, resins, dye-stuffs and herbs are also found in these forests. But, the lumbering industry has not fully developed because of the difficulties of transport and climate.

Mediterranean Ever-greens—In the Mediterranean regions which are situated in the sub-tropics, we also find broad-leaved hard-wood ever-green trees but they should be called shrub-woods rather than actual forests. Laurel, cork-oak, chestnut and olive are the characteristic trees. These trees have long roots, thick leathery smooth leaves, thorny branches and crooked trunks.

Monsoon Forests—Monsoon forests occur, where the annual rainfall is between 40" to 80". Sal and Teak are the characteristic trees. Their leaves are broad, their wood is hard but they do not remain green all the year round. They shed their leaves just before the warm dry season. Arjun, mohua, shesham and bamboo are other trees that grow here. Coarse grasses are also found. Mango tree is also an important feature of the monsoon forest. India, Pakistan, Burma, Thailand, Indonesia, South China, South Japan, North Australia and Mexico are the important areas where these forests occur.

Temperate Deciduous Forests—Deciduous forests of hard-wood broadleaf variety are also found in the middle latitudes or the warm temperate regions. Oak, walnut, spruce, poplar and chestnut are the important trees there. These temperate deciduous forests are found in the central plain of Europe, in the Appalachian hill region of the United States of America, in North China

and Japan. On mountain slopes ranging from the height of 3,000 to 9,000 ft. also these forests are found. But in most of the temperate areas, they have been cleared for agricultural development, so that they are now only found on hill slopes or rugged lands. In India and Pakistan, temperate deciduous trees occur along the slopes of all Himalayas where dry fruits, like almonds, apricots and walnuts are collected.

Coniferous Forests—Coniferous forests are ever-green and they yield soft-wood. Their leaves are needle-shaped. The wood contains resin and oil. These forests are found in a continuous belt in the Northern Hemisphere along the north of North America and Eurasia. These forests also occur on certain mountain heights between the elevation of 9,000 to 12,000 ft. The coniferous forests chiefly occur in Canada, Scandinavian Peninsula, Finland and the northern part of the Soviet Union including Siberia. They are also found in the extreme south of South America and New Zealand. Pine, spruce, fir, cedar, hemlock are some of the important varieties found in these forests. Their characteristics are thick trunks, pointed tops and thick but smooth bark. Due to their conical leaves and shape, they are able to safe-guard themselves against the snow and the fast winds of this region. These forests are seldom dense. Trees of same type are found in clusters and one can move through them very well. The snow-fall in winter is helpful in the transport of logs which can be rolled over this snow and can be carried down when it melts. These forests are the great commercial importance because they yield soft-wood which is used not only for making furniture and packing cases but is also a very important raw material for the paper and the rayon industries.

The best type of coniferous forests are found in Canada where they have been exploited to the most. In Siberia, these forests spread from the Ural mountains to the Pacific coast and are known as the *Taiga*. But due to muskegs, it is difficult to move across these forests. Besides, the trees found in North Siberia are short-statured and yield knotty wood which has less commercial value.

Tidal Forests and Thorny bush-woods—Besides these important forest types generally encountered as one moves from the Equator to the Poles, we find small pockets of two other types of forests. On the coastal margins which are inundated by tidal water, we find *swamp or tidal forests* where trees of the man-grove family occur. Sundarbans in the Ganges delta are a characteristic example of this. Similarly, in hot desert areas, *thorny bush-woods* are found and the characteristic desert trees are acacia, cactus, etc. The babool tree found in India is a characteristic variety. These forests, however, have limited commercial value.

2. FORESTS AS AN ECONOMIC RESOURCE

The commercial importance of the forests depends on the fact whether lumbering has developed. From this point of view, the temperate hard-woods and soft-woods are the most important. Coniferous and deciduous forests found in the temperate regions, which cover lands of Europe and North America, are economically most developed and there lumbering is carried on in the most scientific manner. Rubber, which is a very important raw material in the world's automobile industry, comes from the tropical forests. The value of the forest, therefore, depends on its commercial and economic exploitation.

The forests are a great national resource and they are, therefore, known as national assets. They have helped man in various ways and besides their contribution to climate and soil fertility, the forests yield valuable raw materials which are in great demand in modern industries. Indirectly, the forests make the climate equable and increase the quantity of rainfall. They reduce the intensity of wind and increase the fertility of the soil. By checking soil-erosion, they protect agricultural land. But the direct advantages from the forests are many more. They yield valuable timber, fire-wood and several other types of secondary produce. The timber is used in the manufacture of beams, planks, building structures, furniture, ships, boats, packing cases, etc. The wood pulp is the raw material used by the paper and rayon industries. Match-making is also dependent on forests. Several dye-stuffs, resins and oils are also forest products. Rubber, gettaparcha, cincona (which yields quinine), lac, lacquer, camphor, turpentine oil, cork etc. are some of the other most important forest products.

Importance of Timber—According to weight, wood comes next to coal among the raw materials used by the countries of the world. Canada, United States of America, Soviet Union, Sweden, Finland, Germany and Japan produce 75% of the world's timber. North America, Oceania and Europe, where only 24% of the world's population lives consume 70% or more of the world's production of timber.

The chief uses of timber in the world are given below :—

USE	Lakh Metric tons	Percentage
Fire-wood	... 6,400	54
Building construction	... 4,000	33
Paper	... 600	5
Beams	... 250	2
Mines	... 200	1.6
Rayon	... 50	0.4
Others	... 500	4
Total	... 12,000	100.00

World Trade in Timber—In 1968 coniferous log exports, compared with 1967, rose by 25 per cent, to 21.1m. cubic metres. Broadleaved log exports rose by 20 per cent—an expansion that took place mainly in South-East Asia, and also Africa.

Exports of coniferous and broad-leaved sawnwood both increased by about 20 per cent, while in the wood-based panel products sector, veneer-sheet shipments rose by 20 per cent, mainly from South-East Asia, and plywood exports increased by 23 per cent.

Pulp and paper also witnessed a fast expansion with pulp exports up by 10 per cent over the 1967 figure. Printing and writing paper was up 24 per cent and paper and board up 14 per cent.

World wood production in 1968 reached a total value of \$45,500m., which is practically double the 1950 level. Of the total, processed wood and wood-based panels accounted for \$21,000m. and pulp products for \$19,000m.

The record since 1950 shows that the largest expansion has taken place in the pulp products sector.

The value of production of sawn-wood sleepers and box-woods reached almost \$16,000m. in 1968, representing an increase of 55 per cent over 1950, and 18 per cent, over 1960.

The fastest growing sector is, however, the wood-based panel products (veneer sheets plywood particle-board and fibreboard) which in 1950 represented a total value of only \$1,000m. and in 1968 reached \$5,400., becoming the third most important forest product group.

Trends for the Future—By 1975, the world will need nearly 50 per cent, more wood and wood products than it did in 1961, according to a new study made by the Food and Agricultural Organisation.

The 1975 total needs are calculated to be 1,500 million cubic metres of industrial wood and about 1,200 million cubic metres of fuel-wood. Fuel-wood today makes up as much as one half of all the wood used in the world today. In Africa and Latin America, nearly nine-tenths of all wood used is fuel-wood ; in Asia (excluding Japan), it is two-thirds ; in Europe and the Soviet Union a little more than one quarter and in North America, one-tenth.

The use of wood as fuel is gradually declining, although the huge expansion of rural populations in the developing countries means an overall increase in their demand to 1975 and beyond.

The largest growth in demand will be for wood for pulping and this demand could be met through more intensive management of forests now in use, expansion of forest reserve and establishment of man-made forests.

Looking beyond 1975, while today much of the industrial wood is supplied by Canada and the Soviet Union, their huge reserves are not limitless. But other regions might come into prominence as timber suppliers through man-made forests capable of yielding five to ten times higher produce than those of temperate forests.

In New Zealand, for instance, the annual timber yield from plantations was expected to more than double over the 14 years 1961-1975.

One encouraging point is that the rich and extensive tropical forests of South East Asia and Western Africa could be made more productive more easily than similar forests in Latin America. However, fuller use of the world's tropical forests hinges upon problems defining and protecting forest areas, devising suitable forest management systems and by finding markets for a wider range of the many tropical hardwood species.

Conservation of Forests—The forests are a national asset, and they yield valuable revenue to the Government. Now-a-days, every Government is trying hard to protect its forest wealth, increase the extent of its forests and regulate the use or cutting of forests. This is specially so in Canada and United States of America where the forests were destroyed recklessly in the early stages of colonization.

In the unexploited forest areas, people are busy hunting and trapping the fur-bearing animals and these regions have supplied the raw furs of the world. But gradually the fur resources of these regions are getting depleted. Therefore, the fur-yielding animals are now domesticated and fur farming is carried on.

2. DISTRIBUTION OF FORESTS

The forest reserves of the world are distributed over the surface of the world according to the climate conditions and a rough idea can be obtained from the figures given below :—(Lakh acres)

U.S.S.R.	...	...	9,20,000	India	...	46,779
U.S.A.	...	...	2,51,537	Canada	...	3,41,963
U.K.	...	...	1,595	Brazil	...	4,80,195
China	...	...	84,000	Pakistan	...	2,537
Japan	...	...	22,545	World Total	...	39,49,000

Forest Resources of North America—20% of the world's forests are found in America. *Canada* is known as the British common-wealth's store-house of soft-wood. The production of timber in Canada is so huge that it is greater than the total production of the five chief timber producing countries of the world. British Columbia, North Prairie, Ontario, Quebec and New Brunswick are

the main centres of lumbering industry. The Pacific and Rocky mountain forests extending through British Columbia have a very great advantage of being served by the trans-continental railways. The trees found here are all of soft wood and as such are of great economic value. On the northern rim of the Great Lakes and in the St. Lawrence Valley also forests occur although some of these have been cleared. To the north of these two regions, we find the great forest reserve of Canada which is sprinkled with lakes and marshes. The Canadian Pacific railway passes through it and certain mineral areas also occur here. This great forest belt is yet without any industry except lumbering on its southern edge. Ottawa river is a very important outlet and the city of Ottawa is an important lumbering centre and timber market. These forests have suffered very much in the past from the fires and the rate of growth of the tree is slow. But the work of afforestation has now been started and it is hoped that very soon the deficiency will be made up. The only means of movement through these forests is by means of canoes. Forests also cover much of the interior New Foundland and wood products are the chief exports from that cold foggy island. On the whole, Canadian forests have a great advantage of being mostly soft wood or some what in the eastern part a mixture of soft and hard woods. Then there is a very good system of transport through these forests. Last but not least is the availability of cheap hydro-electricity because of which the lumbering and saw-milling industry has developed very much in this country. Canada has 110 paper mills and it occupies the second place among the paper producing countries of the world.

The *United States of America* has a very extensive natural forest region which covers 1/3rd of its area. In these forests, more than 1,100 varieties of trees are found, out of which 150 varieties are commercially important. About 50 varieties of trees are utilized in saw milling, ply-wood manufacture and preparation of wood pulp. Douglas fir, pine, oak, hemlock, maple, spruce and cypress are the chief varieties. The soft wood forests of the United States of America extend in two belts, one on the east and the other on the west. The north-eastern part of the United States of America is rocky and high-landish. Its climate is also very cold for agricultural purposes. The cold winter and heavy snow are helpful to the lumbering industry and white pine, spruce and hemlock yield valuable timber. Certain broad-leaved trees are also found scattered through this area. As we move from east to west, we come to the second lumber district around the Great Lakes. These forests have been worked the most and, therefore, they are on the verge of exhaustion. Appalachian high-land forests spread from north to south and because of the steepness of the mountain slopes and the littleness of snow, working in these forests is difficult. Here too the trees have been badly cut. Between the Appalachian high-land forests and the forests of North-Eastern United States of America, we find mixed coniferous and deciduous trees, the hard-wood broad-leaved deciduous trees being

more in number. Lumbering has been going on for a very long time past and most of the American supplies of hard-wood timber still come from these regions. Towards the south-east along the Atlantic coastal plain, from New Jersey to Texas, we find valuable yellow and hard pine forests. This wood is of great value for flooring and interior wood work. Lumbering is also much easier. Temporary rail-roads worked by donkey engines are the chief mechanical ways for transporting wood. Cypress is another type of tree that grows here and swamp areas are mostly covered with cypress trees. Towards the west, the Rocky mountain forests, which also cover some portion of the west Mississippi valley, are of very great importance. The trees are mainly coniferous and the chief trees are pine, spruce, douglas fir and red-cedar. 75% of this area remains uncut but the forest wealth has been badly affected by fires in the past. Forests are also inaccessible at many places. Building of rail roads is quite expensive. As we move further west, we come to the Pacific slope of the Rocky mountains which are the finest forest districts in the world. Due to even climate, good rainfall, freedom from thunder-storms, trees grow for ages and attain great size. There are certain trees which are almost unburnable because their thick bark holds water. Red wood and Douglas fir often attain a height of several hundred feet and their trunk is sometimes about 100 ft. in circumference. Here lumbering is easy and there are special facilities for working the wood. U.S.A., at present, produces 40% of the world's wood-pulp and 60% of the world's paper. Paper industry is localized in North Eastern U.S.A., Upper lakes region and the Pacific slopes.

Forest Resources of Europe—Europe produces 10% of the world's timber and about 1/3rd of its area is under forests. The European forests can be divided in two parts : (1) The forests of Scandinavia, Baltic lands and Finland and (2) Forests of Russia and Siberia. Scandinavia, Finland and Baltic States and North Russia have ever-green coniferous forests. These areas also have the facility of river transport and hydro-electric power. Therefore, lumbering industry has developed the most in this region. In the rest of Europe, with the coming of industrialization and demands of population for land and settlement, the hard-wood deciduous forests have been cleared and now they are found only in certain mountainous tracts in France, Germany and other West European countries. *Sweden* is the greatest producer of timber in Europe. 56% of its land is under forests and it supplies to the world soft-wood and wood pulp. Window frames, paper, wood pulp and plywood are the chief items of export. 1/4th of the total area of *Norway* is under forests and pine is the chief tree. Paper manufacture is the chief line of industry. Most of the wood cut is utilized for the manufacture of wood pulp, newsprint, cellulose, card-board and matches. The forests in Norway have a special advantage provided by the presence of many streams on which logs can be floated and power for the saw-mills can be

generated. Then, there is further attraction of having the English market close by. In Sweden, however, the ice-closed rivers and harbours, for several months of the year, present a very great difficulty. *Finland* comes third in importance and timber obtained from the forests is the most important single factor in national economy. Three-fourths of its area is under forests. 85% of the value of all exports are timber products, including pulp and paper. In *Russia* the extent of forests is more than 1/3rd of its area. Pine, fir, larch and spruce are the chief trees. The timber of its trees is utilized for building construction, paper manufacture and cellulose. The timber reserve in *Russia* is four times that of *Canada*. The most extensive forest reserve is found in Asiatic *Russia* or *Siberia*. Other forested areas are along the north-east and north-western parts and in the Ural mountain region.

Forest Resources of Asia—28% of the area of Asia is under the forests. The whole of *Siberia* of north Asia is full of coniferous forests but because of intense cold and difficulties of transport, lumbering has not progressed very much. *Japan*, *China* and *India* are some other important areas with rich forest wealth. Necessity has forced *Japan* to take excellent care of its forests. The hilly nature of the country and the heavy rainfall make much of the land of the country covered with forests. In the absence of coal-supply, *Japan* used its forests both for fuel and building purposes. After the industrial revolution, *Japan* has utilized its extensive forest reserves scientifically and the chief type of forests found in *Japan* are :—

1. Coniferous forests in the north.
2. Tropical Monsoon forests in the south.

Bamboo, lacquer and camphor are the chief forest products of *Japan*. Japanese people make the best use of bamboo and use it in several ways. They exploit their forests in the most rational manner. Paper manufacture, wood pulp manufacture, toymaking, match-making and rayon manufacture besides ship-building directly depend on the raw materials found in the forests.

India has 1/5th of its area under forests. It has four types of forests :—

1. Ever-green forests on its western coast and the lower Himalayas.
2. Monsoon forests in Central India and Deccan land.
3. Mountain forests having coniferous trees like spruce, pine, fir and deodar on the western slopes of Himalaya and oak and magnolia on the eastern slopes.
4. Tidal forests found in the Ganges delta.

Sal and teak are the most important varieties got from the Indian monsoon forests. But the most important products of these

Forests are lac, catechu, several types of oils, spices and herbs besides sabai grass and bamboo which are of great importance as the raw materials for Indian paper industry.

In *China*, although the forests are very extensive, they have been badly destroyed by the reckless methods of use in the past especially during the long years of war with Japan as also the civil war at home. Therefore, Chinese people are fast building up their forest reserves again. In North China, we find the temperate deciduous forests while in South China, monsoon forests occur. The most important product of Chinese forests in the south is teak-wood and tung-oil.

3. FOREST PRODUCE

Forests are the national assets and the main source of income to the Government. Several types of products are got from the forests and they can be divided into two groups—the *primary product* and the *secondary product*. The primary product, which is the most important, is timber—timber which is used for several purposes like the manufacture of wood-pulp, matches and rayon from soft wood; furniture, beams, planks, structural material from hardwood. Besides these, we also get bark, leaves, fibres, fruits, dye-stuffs, oils, gums, resins, rubber, tanning material and several types of herbs. These constitute the secondary products of the forests.

Primary Products—Timber is the most important forest produce. It is used in the construction of houses, ships, railway sleepers and furniture. Wood or timber is cut into big logs and is taken to the saw mills. The logs of wood or timber are of two types :—

1. *Soft-wood timber* comes from ever-green coniferous forests in which pine, fir, spruce, cypress are the most important varieties. This timber is very light and it is also easy to cut. Canada, U.S.A., Norway, Sweden, Soviet Union and Australia are the main areas which yield this type of timber. The wood is also made into wood-pulp for the manufacture of paper. Besides, matches and packing cases are also manufactured from this wood.

2. *Hard-wood timber*, which is found both in temperate and tropical areas, is obtained from both deciduous and ever-green forests. Hard timber is of the following three varieties :—

- (a) The hard-wood of temperate deciduous forests in which the most important varieties are oak, beech, maple, ash, walnut and elm. This wood is used in the manufacture of furniture. Central Russia, Alps Region, Japan and Central U.S.A. are the main sources from which this type of timber is obtained.

- (b) The wood found in the ever-green forests of the tropical area is also very hard. Mahogany and ebony are the chief types of

trees. Their wood is harder than that of the tree found in temperate regions. They are difficult to cut and that is why we find very little lumbering in operation in these areas. Amazon basin in South America and Congo basin in Africa are the chief areas where this type of wood is available.

(c) The timber resources of the monsoon deciduous forests are also of the hard variety. Sal and teak are the chief trees. This is very good for the manufacture of furniture, beams and sleepers. India, Burma and Siam are the chief sources of its supply.

Factors responsible for the development of Lumbering—
The work of cutting wood into logs is known as *lumbering* and this depends on a number of factors.

1. The trees of the type must be found centralized over a small area so that not much time and energy is lost in finding out the trees of the right type. In the coniferous ever-green forests, for miles and miles only one type of tree is found and this is helpful and economic from the point of view of exploitation.

2. Wood is heavy and cheap. It can be transported with difficulty. Therefore, the tendency is to have saw mills and even the planing mills at the place where lumbering is carried on. In those forest areas, where natural water-falls exist, cheap hydro-electric power can be generated and the saw mills, planing mills and even pulp-making units can be established easily.

3. Adequate transport facilities are the most essential feature. Transport must be cheap and without any difficulty.

4. Markets must be near-by so that the cost of timber does not go up on account of over-head transport charges. If timber is to be transported over long distances, it not only becomes costlier but also its quality goes down, because it might remain exposed to sun and rain.

5. Lumbering requires a good deal of labour and, therefore, it has prospered where cheap labour in sufficient numbers is available.

Facilities found in Temperate Forests—Most of these facilities and factors favourable to lumbering are found in *temperate forests*. Besides, the temperate forests have two extra facilities. The temperate forests are free from dense under-growth which hinders the transport of logs from the interior of the forests. The winter snow presents a very good hard surface over which horses can easily drag the logs of wood, which can further be transported down the rivers when the snow melts. Secondly, in most of the temperate regions, specially where soft wood forests are found, the winters are so cold that no cultivation or farming is possible. Therefore, agricultural labour is free to work on cheap rates in the forests. Then the occurrence of a few types of tree over vast

areas and the presence of water-falls, besides nearness to market, are the chief factors that have promoted lumbering in the temperate latitudes.

Difficulties encountered in Tropical Forests—As against this, the *tropical forests* have, by and large just the reverse state of affairs even though some very Favourable conditions are also found. (1) Great rivers which are full with water due to heavy rains provide a very cheap means of transport. (2) Mahogany, teak and ebony are woods of special strength and beauty which are always in great demand. (3) The labour is very cheap. Still the difficulties are so many that lumbering has not progressed in those forests on any great scale. (1) The different types of trees are found scattered and intermingled so that much time and energy is lost in finding out trees of commercial importance. In order to locate commercially important trees, the help of aero planes has to be taken. (2) Then there are no facilities for the generation of hydro-electricity or any other alternative source of power. (3) Because these areas are suitable for agriculture throughout the year, the labour supply is not certain and most of the people want to take to agriculture which is easier than lumbering which is hazardous and uncertain. (4) The forests are so dense, their under-growth is so thick and the ground is so covered with marshes that it is a problem to move through them. (5) The climate is also not healthy and very few people venture to go there and work in the forests. (6) Lastly, large industrial and mining areas, which are markets for timber, are absent in the tropical areas and wood is often eaten away by white-ants, etc. so that if it is used it has to be carefully looked after. On account of these reasons, lumbering has not progressed in the tropical areas and the tropical forests are important for their secondary products. Rubber, guttapercha, gums, resins, camphor, spices, dye-stuffs, and oil kernels are the most important varieties of produce obtained from these forests.

Lumbering in Different Regions—The commercial timber of the world is yielded more by the forests of the temperate regions than by the tropical forests. 80% of the commercial timber of the world comes from the temperate coniferous forests, 18% from the temperate deciduous forests and 2% is yielded by the tropical forests. Europe and North America are the most important centres where lumbering has developed. In *Europe*, Norway, Sweden, Finland and North Russia are the most important centres from where commercial timber of the world is obtained. In *North America*, Canada, north-eastern and western parts of the U.S.A. are the most important centres for lumbering. The comparison between these two areas reveal some very important features.

In *Europe*, scientific forestry is practised. The forests are well-managed and produce their maximum output. The industrial regions of Europe consist of four times as many people as in the

U.S.A. and, therefore, they cut their forests carefully and raise timber with as much attention as their food-grains. The European timber consumption per capita is also less, only 1/5th or 1/6th that of the U.S.A. In U.S.A. farm houses are made while in Europe such houses are absent. Then in Europe, barrels and packing cases are used repeatedly and very often baskets made of round or split twigs of willow, which is especially grown for this purpose are used.

As against this, the early settlers in the *U.S.A. and Canada* found their land covered with forests and cut them down recklessly. The forest-fires also take away a lot of timber every year. Then the American people every year destroy tens of millions of barrels and packing cases after they have been used but once. The way of raising forest is also different from what it is in Europe. The trees are planted thickly and when the trees are $1\frac{1}{2}$ or $2\frac{1}{2}$ inches in diameter, they are cut for use as been-poles and hop-poles. The later thinnings furnish wood for fire and for the frame work of the plaster houses. At the end of 100 years or more, after many thinnings, the forests contain only big trees that can be sawn into planks and building timber.

The forests of *Asia* are no less important but their value lies as reserves for the future. The forests found in Asia are of great variety and we find tropical as well as temperate forests of all types spread over the length and breadth of this continent. But while the tropical monsoon areas of Asia cut sal and teak which are hauled through the forests by elephants, they are more important for their secondary produce, the most important being guttapercha, camphor and lac. The temperate forests, which spread from east to west in Siberia or north Asia, hold out a great promise for the future but at present they do not offer any great commercial or economic product of major importance.

Raw Materials for Paper Industry—The most important single industry which depends on the soft wood forests is the *manufacture of paper*. The paper industry derives its raw material supply from these soft wood forests. The paper is prepared from two sources, (i) wood and (ii) straw and grass. Both these raw materials come from forests. The chief tree trunks used for making wood-pulp are temperate soft woods, spruce being the most important. For making better quality paper, in order to give a superior surface, the wood-pulp is mixed with rags.

The wood pulp is of two kinds—mechanical and chemical. The cheapest is simply ground wood which makes the easily perishable newsprint. It is pulped by mechanical processes. Spruce and fir are the most important trees for the manufacture of mechanical pulp. Newsprint is the product of mechanical pulp. But for high grade writing and book papers, we use the pulp of spruce and poplar trees along with rags. To give a longer and stronger fibre,

the wood for these papers is pulped by chemical processes. Sometimes, the paper of better quality is prepared from a mixture of mechanical and chemical pulp.

Rice, wheat and rye-straw is also used for making cheap type of wrapping paper and paste-board. Sawai and Bhabar grasses found in India, Alfalfa grass found in Atlas Highlands and the Pampas of South America is another type of raw material used by the paper industry. Last comes the bamboo which is again a tropical product. But, by and large, the paper industry of the world has to depend on soft wood-pulp both for newsprint and the superior kind of paper.

CHAPTER IX

Fishing

Fishing is an important primary industry and it is an important article of food and trade. It is estimated that about 30,000 kinds of fishes are found in the world. Some of these are found in fresh water, but majority is of those which are found in seas. In the oceans of the world, fish forms such an important resource as never decreases howsoever we might use it. Fishing does not require any special hard work nor does man have to wait for it. The fish grow in such large numbers that there is no question of their ever being finished as an economic resource. Still careless and reckless exploitation affects this resource to some extent. The sturgeon fisheries of the Great Lakes have declined 98% in the last forty years. The salmon catch has almost disappeared from the Atlantic Ocean and even in the Pacific Ocean, the resources have declined to one half. Fishes are found in seas, lakes and rivers, but in order that the people of a place might take to catching fish as an occupation, it is necessary that certain conditions must be fulfilled.

1. FACTORS CONTROLLING FISHING INDUSTRY

Fishing as an industry requires that there must be fish of good edible quality, easily available at a suitable distance and in sufficient numbers. Fish depends for its food on an animal organism which is found in sea water upto a depth of 100 fathoms. This animal organism or *plankton* depends upon a vegetable plankton which grows in those areas which receive silt and other deposits brought by the rivers. Therefore, it is apparent that fish will be found only in those regions where there are suitable conditions for the growth of their food, the animal and the vegetable plankton. Plankton requires certain mineral salts and carbon dioxide gas. These things are brought to the sea by the rivers and, therefore, near the sea coast up to a depth of 100 fathoms, where sun light can also reach, fishes are found. The rivers bring food for the fish but they also harm the growth of fish by polluting seawater. In those areas, where rivers bring lot of filth and rubbish with them, they hinder the growth of plankton and do not allow the increase of fish. Factories, ships, coal mines, chemical works, cities and towns are the greatest polluters of the water.

Along with the presence of food, there is another important factor which may be called the spawning habit of the fish. Practically all good fishes, which are of value to man, have the habit of laying their eggs in shallow water. The season for spawning is fixed for each variety and the fish travel for this purpose for hundreds of miles and from very deep oceans to the shallow water areas. Fish is gregarious by nature and, therefore, it travels in large shoals and other fish which depend on these follow closely. In this way, they offer themselves easily for the catch.

In those countries of the world where land is surrounded by sea from all sides, man normally takes to fishing as a normal course. He is always in touch with the sea and never minds going out far into the sea.

If the land is agriculturally suitable and fertile, people are more likely to take to farming and growing of crops. Therefore, fishing as an industry develops only in those regions where there is paucity of agricultural land so that the population has to depend on the sea for its food supply. People in those countries which are mountainous or otherwise infertile have been forced to take to fishing industry.

Fishing requires boats and boats require wood and harbours. This naturally means that those areas, where the land is forested and the sea coast is indented, have the additional facility of making fishing boats as well as providing sheltered harbours to them.

After fish has been caught, it cannot be kept for a long time, because dead fish grows stale very soon. Therefore, in order to preserve the fish caught, one has to take to various methods and preserve it either in salt (brine) or in alcohol or in cold storage. In those countries of the world which have low temperatures all the year round, keeping fish after it has been caught, is not a very great problem.

2. AREAL DISTRIBUTION OF FISHING

The principal fishing grounds of the world can be divided into two groups : (a) North Atlantic (b) North Pacific. The two important centres of fishing in the North Atlantic are the Grand Banks, i.e. New Foundland, East Canada and North Eastern U.S.A. and the Doggers Bank near North Sea i.e. the coastal lands of North Western Europe. In the North Pacific region, seas around Japan and North Pacific Coast of British Columbia in Canada are the two famous fishing centres.

The most important fishing grounds of the world are situated in the northern hemisphere and in the temperate latitudes. The chief centres of fishing industry are North Atlantic and North Pacific oceans. There are several reasons for the concentration of this industry in these regions only.

Conditions Favouring the Location of Fisheries in Temperate Regions—Because of the cold temperature, the fish breeds in greater numbers and they also find a large supply of their food-plankton. Most of the varieties of fish found in the temperate latitude are useful to man and they serve very well as food.

The temperate latitudes of northern hemisphere are washed by huge ocean currents. These ocean currents provide very good lines of movement for the fish and therefore, we find the availability of fish localized without much effort.

Most of the fish have the habit of travelling in large shoals and, therefore, it is easier to catch them.

The coast lines of Atlantic and Pacific oceans in the northern hemisphere have been once under the great ice-sheets. On their melting, extensive deposits of silt were made in the shore area. As such, there is an extensive continental shelf fringing the vast continents of the northern hemisphere in the Atlantic and Pacific oceans. This continental shelf is further fed by hundreds of rivers which come after flowing over these continents and bring materials for the plankton to thrive.

In this region, the soils of the neighbouring areas are so un-productive and the physical features are so rough and uneven that the people of those areas have to depend upon seas for their food supply. The people are virtually driven to the sea because of the paucity of good land and general scarcity of food supply from the land.

The great Ice-sheet, which has been responsible for the building of extensive continental shelves, has also given to these regions of the North Atlantic and North Pacific oceans, a broken coast line where sheltered harbours can easily be constructed and fishing carried on.

All these areas are covered with forests which yield valuable timber for the manufacture of fishing boats.

The low temperature favours preservation of fish caught for a longer period. The temperate conditions provide natural refrigeration and fish, after being caught, can be kept without getting stale for a sufficiently long time.

The temperate latitudes of the northern hemisphere are inhabited by people who follow Christianity. These Christians mostly Catholics, abstain from meat every Friday. Therefore, they compulsorily take fish and the fishing industry has been very much encouraged by this religious practice among them. That is why also we find a large amount of commerce carried on in fish in the temperate regions.

Difficulties of Fishing in the Tropical Regions—As against this, the tropical areas of the world are very much backward as far as fishing as an industry is concerned. The tropical seas are no

doubt rich in a large variety of fish but most of them are so dangerous and poisonous that they cannot be eaten. The plankton on which the fish depends is also not very much abundant in tropical seas. The varieties of fish found is no doubt very large but the number available in each variety is not very much. Then the continental shelf or the six-hundred feet shallow water area is very much less extensive in the tropical areas which never had the advantage of being covered by the ice-sheets. If we took at the map of the world, we find that the largest extent of the *continental shelf* is only around Indonesia and this too is bifurcated into the two parts by a *deep*. The high temperatures prevailing in the tropics are a great hinderance to the preservation of fish after it has been caught. The fish caught gets stale even in the course of its journey from the areas of catch to the market. The advantages of indented coast line, sheltered harbours and the shortage of food supply are also absent here. As a matter of fact, the river valleys of the tropics are so fertile that the people get substantial supply of food from the land and they seldom have to depend on the sea for their food supply. The populations are, no doubt, large but they have a simple living and for that they get enough food from the land.

In the tropical areas, therefore, there is an absence of commercial fishing and marine fisheries. For local needs, however, fishing as an occupation is carried on at several places and fish is caught from the rivers and lakes. The fresh water fish is enough for local population and there is no large scale trade in fish in the tropical areas. Whatever trade is, it is local or at the most regional in the very narrow sense. A large number of fish are caught from the rivers of India and South-east Asia but these are consumed by the local population and every day's catch is brought to the market. China is developing its river and coastal fisheries through five-year plans.

The most important *fishing grounds* of the world are the following :—

- (a) North Atlantic.
- (b) North Pacific.

North Atlantic region consists of New Foundland, eastern Canada and North-Eastern U.S.A. on the one hand and the coast lands of North-Western Europe on the other. The North Pacific region consists of Japan and the seas around it in the West and the North Pacific coast of British Columbia in North America on the east.

(a) **The North Atlantic Fisheries of North America**—This region consists of New Foundland, Labrador, Nova Scotia in Canada and New England States in the U.S.A. This region is rich in rivers, bays and has an extensive continental shelf. South of New Foundland are the "Grand banks" which are very rich

Halifax, St. John, Montreal and Portland are the most important centres for this industry. Boston is the most up-to-date fish port and comes next to Grimsby. 2/3rd of the export trade of this area consists of fish or their products.

(b) **The Sea Coast of North-Western Europe**—The North Sea is the most extensive fishing ground of the world. It is surrounded on all sides by the densely populated lands of Great Britain, Holland, Norway, Germany, France, Denmark and Belgium. The area affording the best conditions for fishing is known as "Dogger Banks".

Although all these countries of North-Western Europe take part in fishing, Norway and Great Britain are the most important. The *Dogger banks* provide facilities for trawling on a large scale. The large quantity of silt brought down by the European rivers to the North Sea and the movements of ocean water around Great Britain through the North Atlantic drift are very great advantages for fishing in this area. *Great Britain* is the second largest fishing nation of the world. Fishing occupies the sixth position in the occupations of *Englishman*. More than 40,000 people have taken to this occupation. Herring, cod, makerell, oyster and haddock are the chief varieties of fish caught, herring being the most important. Half of total catch of Great Britain consists of herring. It is sent to Europe after being dried and salted. Aberdeen, Hull, Yarmouth, London and Grimsby are the most important fishing ports, the last being the most important among the fishing nations of world. Great Britain imports a large quantity of fish also. The coastal towns of South-east England and South Scotland are the chief centres for this industry. Every year, Great Britain catches about one million metric tons of fish. But still it has to import about 2 lakh tons from outside. The Billingsgate of London is the greatest fish market. *Norway* is very much favoured by nature as regards fishing industry. Its mountainous land covered with forests, indented coast line and healthy climate are very favourable to the fishing industry. About 85,000 people are occupied in fishing. Fishing in Norway is not managed by large companies but by individuals who take it as a part-time industry. The small farmers and village tradesmen become fishermen for a spell during the spawning season. Cod and herring are the most important fish caught. Norway supplies 50% of the world's Cod Liver Oil. One-third of the total exports from Norway consist of fish, oil and other allied products. Due to scanty population there is always a surplus and 2/3rd of the total catch is exported.

(c) **Coastal Areas of Japan**—Japan is the most important fishing nation of the world. It is surrounded on all sides by a shallow water area. The land of Japan is mountainous and plain land for agriculture is limited. Therefore, the Japanese people have to depend on the sea for finding food for their very large population. Very large population, very limited agricultural area and an absence of animal foods have given special importance to

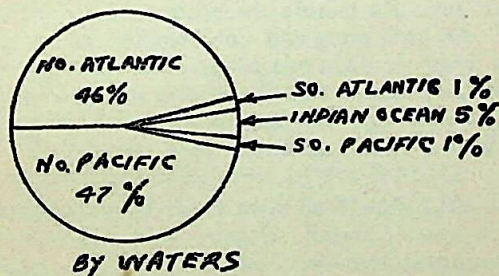
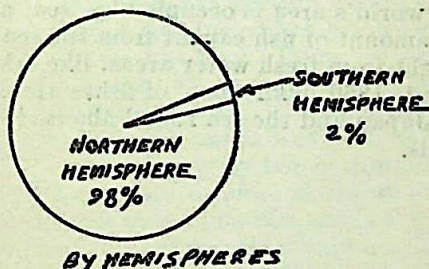
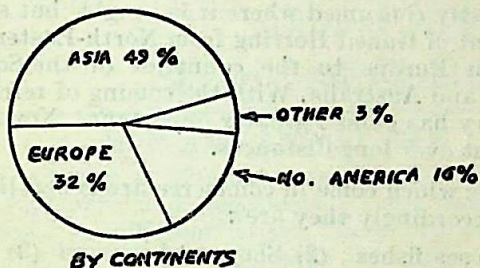
fishing industry in Japan. A little over 10% of the population of Japan is directly engaged in fishing. Japan catches 1/3rd of the world's total and the total catch of Japan is three times as much as that of Great Britain. The longish shape of the country which consists of a large number of islands, indented coast line and the warm and hot currents that wash its shores are further advantages to its fishing industry. Hokkaido is the most important fishing ground of Japan. The most important fish caught on the western coast are cod, herring, mackerel and salmon. Bonnet, tuny and turtle are the chief fish found on the eastern coast. Japan has also a very flourishing artificial pearl industry based on oysters. Japan consumes all the fish that it catches. Fish meal is an important fertilizer used on the Japanese fields. 80% of the fish caught in the cold seas of the north is brought to the populated areas of the south. Japan does not export any fish but it has a very flourishing trade in artificial pearl.

(b) **North Pacific Coast of Canada**—This fishing ground extends from the Gulf of Alaska in the north to N. California in the south. British Columbia is the most important area engaged in fishing. Salmon is the most important fish caught in this area. The salmon fish travels in large shoals and some of the inlets of the Pacific ocean are only traps for it. The salmon has the habit of breeding in the fresh water of the rivers. As a result of this fish moves in large numbers into the rivers that fall into the Pacific ocean. As the fish enters the estuaries of these rivers, they find it difficult to go back because right on the mouth of the river, a chain of islands is situated. The fish catch, therefore, becomes easier and large. Several hundred mile long Puget Sound is surrounded from all sides and when the fish reach there, they feel that they have reached the open ocean but they are still in the shallow water area and are easily caught. The common method of catching salmon is by means of a water wheel or fish wheel. It is a large wheel revolving in the swift current and the attached wire buckets catch the salmon and throw them into a boat below the wheel. The workmen employed are mostly Chinese. The indented coast line, warm and cold water currents, mountainous forested land on the inside are some of the other factors which have given a flip to this industry. Salmon fish is caught in very large numbers and since the population of this region is not very dense, most of it is exported, either salted or tinned. Besides salmon, herring, cod, halibut are also caught. Sardine fish is important on the coast of California. A considerable amount of salmon is tinned and it is an important item in international trade.

3. INTERNATIONAL TRADE IN FISH & FISH PRODUCTS

The chief varieties of fish coming into international trade are *salmon*, *cod* and *herring*. Salmon, as has been said earlier, occupies a very important place in international trade. *Cod* comes

next in importance. It is very popular as a table delicacy and it is in great demand all over the world. Cod fish is salted and dried before being marketed. Roman Catholic countries of Europe, Central and South America and the West Indies, are very great markets for this fish. According to Roman Catholic religion, meat eating is prohibited on Fridays and, therefore, there is a great demand for fish in these countries. Cod comes mostly from Iceland



Commercial Fish catch by continent,
Hemispheres, and water

Fig. 28.

banks and the New Foundland banks, the latter being more important. Narway, New Foundland, Canada, U.S.A. are the most

important exporters. Because of the large market at home, Japan does not export any cod fish. Cod is also used for extracting liver oil. This is used for making medicines, for dressing leather and also for feeding cattle. Norway, New Foundland and Great Britain are the chief producers and exporters of Cod liver oil. *Herring*, which is known as the poor man's fish, occurs in very large number and is caught in the North Atlantic region, both on the east and the west, the North Sea fisheries being the most important. Herring is mostly consumed where it is caught but still there is a large movement of tinned Herring from North-Eastern U.S.A. and North-Western Europe to the countries of the South America, South Europe and Australia. With the coming of refrigeration, the fishing industry has gained greater importance. Now, hard frozen fish can be sent over long distances.

The fishes which come in commerce are generally from these sources and accordingly they are :

(1) Deep sea fishes ; (2) Shore fishes ; and (3) Fresh water fishes.

75% of the world's area is occupied by sea and, therefore, we find that the amount of fish caught from the sea is much more than what is caught from fresh water areas, like lakes and rivers. Every year about 1350 lakh tons of fishes are caught. 37% of that comes from Japan and the sea round about. 18% comes from the British Islands.

CHAPTER X

Animal Husbandry— Sheep And Cattle Rearing

1. MAN AND ANIMAL LIFE

A large variety of animals are found according to the differences of climate and vegetation. These animals influence the life of man in different ways. There are certain animals which man has been able to tame and they have proved useful to him. Cattle, sheep, goats, horses, camels, elephants are of such type. But there are certain animals which man has not been able to tame and instead of being helpful to him, they are a great hindrance in his way. Lions, tigers, bears, jackals, leopards are such animals. These two types of animals have also affected the occupation of man. At a very early stage in human civilization, man used to kill animals of both types and he used to get food, clothes and shelter by the occupation of hunting. The early man moved from place to place in search of animals and very often it so happened that when the animal resources of a place were finished he had to shift to other regions. Therefore, his life was uncertain and very soon he realized that it is better to tame animals and bring them into use. Hunting was followed by pastoral farming. At the present moment, almost all over the civilized world, hunting as an occupation, has gone into the background. People do hunt animals but not for the sake of food and clothes but for sport or in the coniferous forest regions of the temperate north, man hunts the fur-bearing animals for the sake of their valuable skin. But even there hunting is now being replaced by trapping or in more advanced places by fur-farming.

Useful Animals and their role in Man's Life—The animals like cattle, sheep, goats, pigs, camels, horses, asses and elephants are tamed by man. Horses, camels, asses and elephants are useful as beasts of burden. Elephants in marshy areas, horses in mountainous regions and camels in deserts serve for transport—carry goods from place to place, although with the coming of mechanical means of transport, their use is now limited to special areas only. In the deserts, equatorial rain-forests and the difficult mountainous areas, animals are the only source of help to man. In countries of Asia, Africa and in certain countries of Central Europe, animals are also used for ploughing the fields.

Important Animals for Pastoral Farming—The chief animals, which are tamed by man and serve as the basis of pastoral

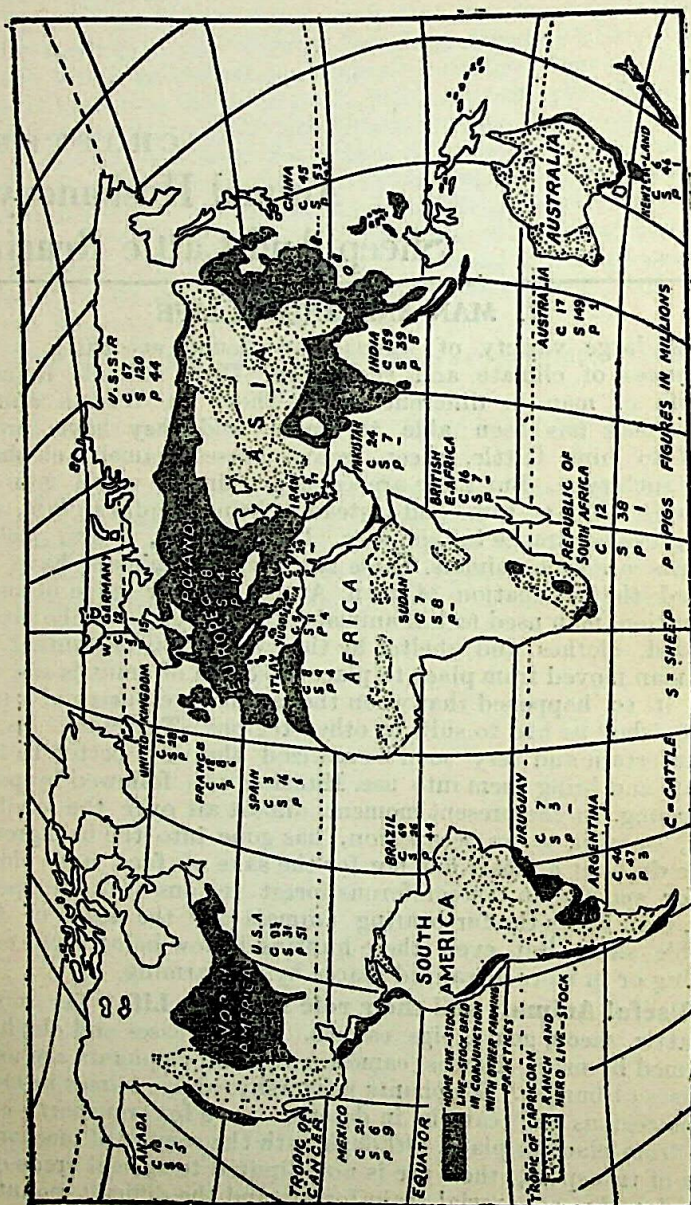


Fig. 29. Livestock and its distribution in the World (Pastoral Farming).

farming, are cattle, sheep, goat and pigs. These animals yield meat, wool and milk products. Through them, we have dairy farming.

meat packing and wool gathering industries. The table given below will indicate the relative importance of these animals *vis-à-vis* the products they yield.

Cattle—Milk, butter, cheese, etc., and meat (*beef*)

Pigs—Meat (*pork*)

Sheep—Wool and meat (*mutton*)

On *Cattle* depend two types of industries—meat or beef industry and the dairy industry. Normally it is seen that beef producing animals are not good for dairy products. Besides, hides and skins, and several other minor products are also yielded by cattle. *Pig* is essentially a meat producing animal and although it is important for pork but it also yields raw materials for making brushes and refining of sugar etc. Sheeps and goats, more specially *sheep* produce meat which is known as mutton as well as wool. But like cattle, the sheep for mutton is practically useless from the point of view of wool and the wool producing sheep do not yield good mutton.

Regions of Pastoral Farming—Pastoral farming is limited to the grass-lands of temperate latitudes. There are two reasons for the concentration. Firstly, the temperate grasslands have a equable climate and secondly the grasses growing there are rich and nutritious. As a result of this, the animals can be kept in the open all the year round and the health of the animals does not suffer from such pests and diseases as are found in the tropical areas. As against this, in the tropical areas, the grass grown in the savanna lands is not as nutritious. Secondly, due to great heat and heavy rainfall, the animals have to be kept in the stalls for 6 to 7 months in the year. In the summer season, when the grass dries out there is a great problem of providing food to animals. Stall feeding is very expensive. Due to hot and wet climate the animals do not keep fit and they suffer from the ravages of pests, like the Tse-Tse Fly and yellow fever. Therefore, cattle rearing on a commercial scale is an industry of the temperate regions only. There is another important aspect. The pastoral farming is more developed in those areas where land is extensive and the population is sparse. In densely populated countries, there is always a competition between man and the animal, both for food and space. This is very clearly seen in India, China and Japan. In Japan there are 500 to 600 people per sq. mile but the number of animals is only $5\frac{1}{2}$ animal in a square mile. In India, the number of animals is the highest but there is no organized pastoral-farming industry and the animals are both ill-bred and badly kept.

2. CATTLE REARING

Cattle rearing provides the basis for two economic produce—milk and meat. Meat of the cattle is known as beef. The dairy produce consists of milk, butter and cheese but, as has been said

earlier, the beef cattle are quite different from the dairy cattle. About 50 to 60 years ago, the cattle of commercial importance were rare but with numerous scientific discoveries, now cattle are found in abundant number over the temperate grasslands. Their ability to withstand heat and moisture has enabled them to go into lower latitudes and with the exception of the very hot and humid Amazon basin, Central Africa and a few places in the Far-eastern tropics, cattle are to be found from the Straits of Magellan to Hudson Bay in the New world and from Tasmania to Kamachatka in the Old world.

Beef Industry

Beef, as the meat of the cattle is called, is not the staple food of the people of this earth and, therefore, beef cattle is only kept in those regions which are not serviceable for agriculture or where the population is very sparse. The sparser the population of the country, the more is the number of meat animals to be found there. In the words of Prof. Russell Smith, "Intensify agriculture as we may, dense populations inevitably find meat scarcer than do sparse populations." In the countries of sparse population, where large areas of grasslands exist, cattle meant for beef are first reared on natural grasses and then brought to large centres where fat increasing food like maize and wheat are given to them. Slaughtering of cattle for beef and meat packing industry is important in the *United States of America, Argentina, and Europe.*

Areas of Production—*Argentina's* wealth is based on her great livestock industry, supplemented in recent decades by the raising of large cereal crops for export. With 44.5 million cattle, she ranks fourth (eclipsed by India 160 m.; U.S. 196 million and U.S.S.R. 70 m.) but as an exporter of raw meat (excluding Denmark's exceptional trade in bacon) she has long led the world. But, of the total slaughterings 76% are consumed within the country. Argentina's per capita consumption—240-lb is the highest in the world.

Chicago in North Central *United States* is the biggest slaughtering centre of the world. The great open plain west of the 100th meridian in North America is too dry for good farming. But it has got extensive grasslands. Therefore, cattle ranching is an important occupation there. After living on grass of these ranches for one or two years, beef cattle are sent to the corn-belt where the farmers keep them for a few months, fattening them on corn before sending them off to the great slaughtering centres. At a number of places, even irrigation is carried on and the nutritious alpha-alpha grass is grown. In the southern States of the United States of America, the cattle can live in the open all the year round and, therefore, as compared to the north, cattle rearing requires less capital and labour in the south. But the possibilities for cattle raising in the southern States of the United States of America

remained out of sight because these regions suffer from cattle-tick and the farmers were affluent with rich cotton crop. But now these regions have turned their attention to cattle rearing.

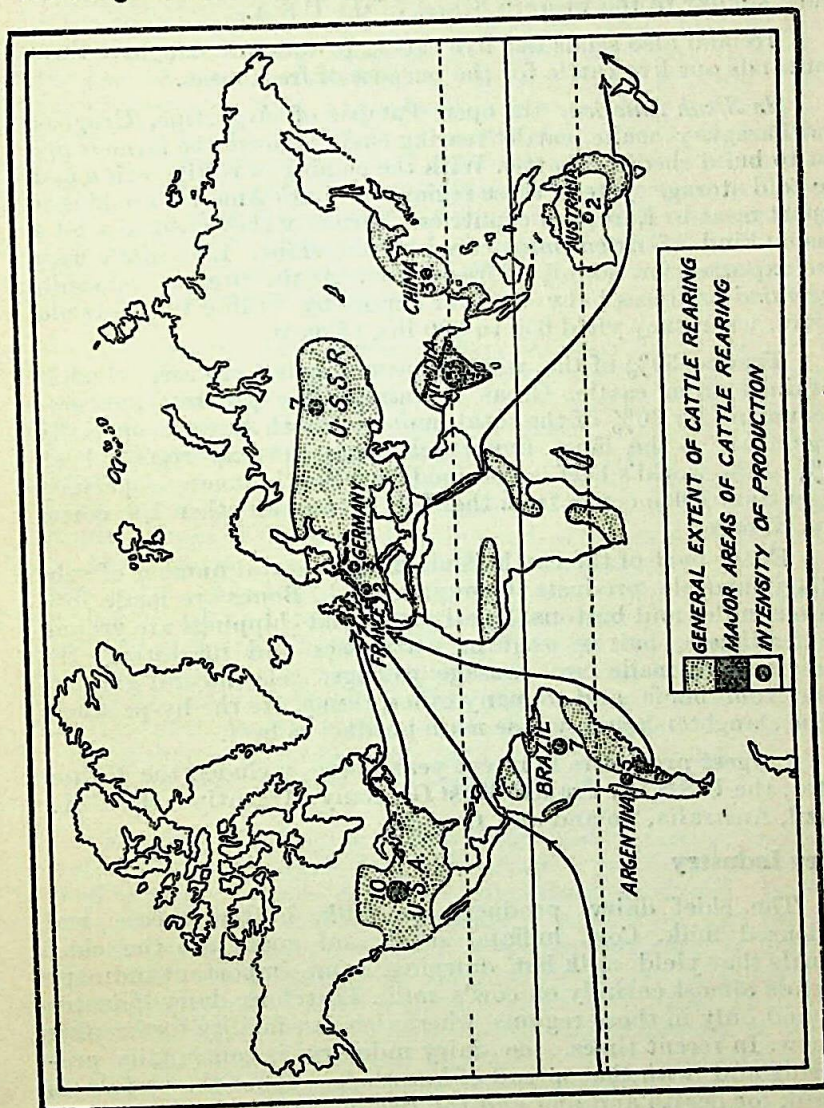


Fig. 30. Areas of cattle-rearing.

The industrial population of *Europe* has a great demand for meat; 90% of the world's meat imports go to the countries of Western Europe. Although the imports of beef in Europe are quite extensive, the production of meat is no less important. Hungary and Poland send stall-fattened cattle to the industrial regions of Western Europe. Because of heavy rainfall and luxuriant growth

of grass, West England and Ireland are also very important cattle raising areas. Russia is third in the world as far as cattle raising is concerned and it has got vast grasslands which are very much similar to the western States of the U.S.A.

Ireland also sends out live cattle. It does not slaughter them but sends out live cattle for the purpose of fresh meat.

In South America, the open Pampas of Argentina, Uruguay and Paraguay make cattle rearing easy because the farmers are not to build sheds for cattle. With the coming of refrigeration and the cold storage system, these regions of South America are able to export meat to European countries. Formerly they used to send a special kind of dried meat cured in sun-shine. Live cattle were also exported for supply of fresh meat. At the present moment, *Argentina* produces baby beef for export by killing two year old calves, when they yield 650 to 800 lbs. of meat.

Trade—50% of the world's meat consists of beef, which is obtained from cattle. Great Britain is the greatest importer accounting for 60% of the total imports. South America, specially Argentina, is the most important among the exporters of beef. 40% of the world's beef is obtained from South America, specially Argentina. 1/4th comes from the U.S.A. and an other 1/4 comes from Europe.

Every part of the cattle is utilized, the total number of subsidiary inedible products being hundred. Bones are made into knife handles and buttons. Small pieces and chippings are ground for fertilizers; hair is used in mattresses and plastering; the intestines are made into sausage casings; gelatine and glue are made from hoofs and so many other things are the by-products of the slaughter-house, whose main product is beef.

Largest producers in recent years have included the United States, the U.S.S.R., France, West Germany, Argentina, the U.K., Brazil, Australia, Poland and Canada.

Dairy Industry

The chief dairy products are milk, butter, cheese and condensed milk. Cow, buffalo, sheep and goats are the chief animals that yield milk but dairying, as an important industry depends almost entirely on cow's milk. Therefore, dairy industry is found only in those regions where there is facility for keeping the cow. In recent times, the dairy industry is continually progressing and with the spread of knowledge about the usefulness of milk for health and diet and the rise in the standard of living, the consumption of milk and its products is gradually going up. Commercial dairying is dependent on factors of climate.

Conditions Favouring Dairy Industry—The lands of moderate coolness, where the rainfall is sufficient for the growth of nutritious grass and other forage, are the best for this industry.

In regions of intense cold, cows have to be kept inside the sheds and in very hot lands, milk and its products deteriorate soon. Therefore, it is only in regions of moderate cold that the cattle can remain in the open all the year round. The rainfall should also be sufficient. Dry areas do not allow the grass to grow all the year round and, therefore, cattle have to be stall-fed during the dry periods. Milk has a bulk weight and is perishable by nature. Therefore, it must be produced near the market where it is to be consumed while fresh. It is only recently that milk has been turned into other products like butter and cheese and transported over long distances with the help of cold storage. Dense population with high standard of living is another necessity for successful dairying because only such types of population can afford to consume milk and its products.

Because of these factors, dairy industry has developed the most in the wet areas of the cool temperate regions. The main centres of the dairy industry are those regions in the northern hemisphere where oceanic climate prevails. Oceanic climate is most suitable for the cattle because in the equable temperatures of this climate, the animals can remain in the open all the year round and it is cheaper to maintain them. As against this, the tropical areas of the world lack in good soft grass for the cattle and the temperatures are so high that milk and butter very soon deteriorate. The temperate regions of the world are also highly industrialized and the industrial population there has a high standard of living. Therefore, they have a great demand for milk and its products. In the tropical areas, on the other hand, due to lack of industrialization, there is no demand for milk and its products and then the climate is also not conducive to the health and well-being of cattle. The milch cattle of tropical areas are weak, lean and thin and have a very low milk yield.

Dairying is a branch of agriculture and as science comes in contact with agriculture and agriculture tends to be more intensified the dairy comes to play an important part in it. In those countries where extensive agriculture is carried on and the land is abundant but the population is sparse, dairying is not very important. As a matter of fact, dairying as an industry is successful only in those regions, where the value of land is sufficiently high. If the land is cheap and abundant, it will be more profitable to keep meat animals or to do crop farming. On the other hand, in those lands where intensive agriculture is carried on, dairying is important as a part of mixed farming. Thus, dairying is a highly intensified industry and in it the farm becomes a kind of factory, using its own raw materials. This results in the conglomeration of a large number of families on a dairy farm and dairying as an industry is found to support a much larger population. With the coming of science and technology, we find that the dairy industry of the world is using more

and more mechanical devices and depends less and less on manual labour.

Regions of Dairy Farming—The chief regions of dairy industry in the world are :—

1. North-western Europe.
2. North-eastern part of United States of America.
3. South-east Australia, and New Zealand.

North Eastern Europe—With its good soil, cool humid oceanic climate, dense population, highly developed industries and a paucity of income from agriculture this region has every requirement for a great dairy region. The scarcity of meat causes cheese to be used far more than meat-eating in America. Throughout the northern plain of Europe, there are small farms with very dense rural population. While they grow grains, the keeping of dairy cow is also exceedingly common. France, Holland, Denmark, southern part of Sweden, Switzerland, Germany and Russia are important producers of dairy products. In *France*, the northern part and the Channel Islands produce excellent butter. Normandy is a very good producer of butter. In southern France, Rouquefort is famous for cheese making. Here cheese has been prepared from sheep's milk for generations and it is kept in stone-caves deep in the ground. In *Holland*, cows are maintained on the most scientific scale and they are provided with every kind of comfort. During cold and rainy weather, they are covered with blankets. They are carefully looked after and richly fed. Fresh milk and butter are the most important products. Holland produces on an average 94,496 metric tons of butter and 2,01,580 metric tons of cheese.

In *Denmark*, dairying is the chief occupation of the people and co-operative societies play an important role in dairy farming. The cool moist climate, nearness to the sea and the lack of land available for agriculture has made Denmark, the most important dairying nation of the world. The land available in Denmark can hardly produce crops which can stand competition with the American farm produce. Therefore, every bit of land in Denmark is utilized for growing fodder for the animals and the work of dairying is carried on through more than 9,000 co-operative societies. Only 10% of the total milk production is consumed locally. The rest is turned into butter and cheese. 80% of the milk is turned into butter; cheese and condensed milk is made from another 10% of the milk. Denmark exports all its butter and imports inferior quality margarine for its population. 75% of the exports from Denmark consist of dairy produce. England is the chief importer of Danish butter. Denmark exports butter to England to pay for coal and steel.

As a result of careful hard work *Switzerland* is an exporter of excellent cheese. *Gruyere* being one of best known brands. Condensed

milk is also exported from this country. Milk chocolate is also an important item of export from the country. Dairy industry is found in the Po valley of *Italy*. One of these, the *Parmesan* cheese is made of goat's milk. But Italy imports inferior quality to feed its people and exports its better quality.

North-Eastern Part of North America—The possibilities of dairy industry in America greatly exceed those found in Europe. America has got the priceless advantage of having a bumper growth of corn which is the best in forage crops. The north American region consists of the provinces of Ontario and Quebec in eastern Canada and the New England region in the north eastern part of the U.S.A. In the provinces of Ontario and Quebec, there are more than 3,000 factories where butter and cheese, specially cheese are manufactured. In this region, the absence of large industrial centres and the presence of favourable climatic conditions, bring about the production of milk in huge quantities. As the land is not generally suitable for agriculture and crop farming, the attention of the rural population has been diverted to dairy industry. But the local consumption of fresh milk is not very great. Therefore, most of it (90%) is turned into cheese.

In the U.S.A., the north-eastern portion, consisting of New England States, is mountainous and, as such, it suffers in general agriculture when compared to the better lands of the west. In this part, however, there is present a very good industrial population and there are large number of industrial centres. Milk and milk products are in great demand. Even though, there is a great demand for fresh milk, due to excessive production and high yield of milk, a large part is converted into cheese or milk power. In this region, much attention has been paid to the increase of milk supply from the cows. By means of improved feeding and cross breeding, the milk supply of the cows has been increased to as much as 20 liters a day. Machines do most of the handling of milk on the dairy.

South Eastern Australia and New Zealand—The region has got certain disadvantages. There is sparse population and a general absence of industrial centres. Europe, which the chief market for milk and milk products, is also at a great distance from this place, but the favourable climatic conditions, good grass and the recent invention of the cold-storage system has given a great encouragement to this industry. In *New Zealand* specially, this industry has attained great height and the future is also very bright. The climate of New Zealand is wet and a wet climate combined with low temperature is not suitable to agriculture. Then, the situation of New Zealand is so isolated from the rest of the world that it finds it difficult to compete with those countries. The only way of improving the economy of this country lies in specializing in dairy produce. New Zealand mostly produces cheese because on account of great distance from the market, fresh milk cannot

last for a long time. Cheese and butter are the most important products besides condensed and powdered milk.

Asia and Africa are very backward as far as dairy industry is concerned. While Europe, North America, South America and Australia obtain 98% of their milk from the cow, Asia gets 48% of its milk from the buffalo, an important milch cattle of Asia.

In Asia the dairy industry is not organized on any scientific scale. Locally the farmer keeps the cow or buffalo and obtains milk, ghee and butter for his family. But we seldom find an organized industry of the types as has been established in the three major regions described above. *Western Siberia* is the only region where, under the influence of Russians from the European side, dairy industry on modern lines has been developed.

India has a peculiar position in this respect. Out of the total cattle population of 6,900 lakhs in the whole world, India has about 1,550 lakh cattle and whether we consider the number of cattle per acre or per head of the population, India occupies the foremost position in the countries of the world. But in spite of this cattle population we do not have any meat industry. As the majority of the population in India is vegetarian, there is not much scope for meat industry. The poverty of the people comes in the way of the development of dairy industry. The average consumption of milk in India per head is hardly 8 ozs. when it is 56 ozs. in New Zealand, 35 ozs. in U.S.A., 39 ozs. in Great Britain, 61 ozs. in Sweden, 40 ozs. in Denmark and 45 ozs. in Australia. The average consumption of milk varies from 1.3 ozs. in Assam to 16.3 ozs. in Punjab. Due to this poor demand, the cattle is kept as part of the home by the farmers and they obtain whatever supply they can for their family. On account of the long dry period, there is no extensive grassland in the country and the rainy season often brings so many pests and diseases that a special care of the cattle's health has to be taken. On the plains of the country, there is such a tremendous pressure of population that if fodder crops are grown for the cattle, human beings, who are continually growing in number, will have to starve. It is because of this reason again that we find the cattle industry in India suffering from poor breed and poverty of food for the animals and lack of marketing facilities for their products. The religious sentiment of the people is against the establishment of slaughter houses and the general lack of organization is the main cause of the lack of a dairy industry in the country. The yield of milk per head of cattle is also very low and whatever little organized dairy industry, we have, that is centred at Agra, Ali-garh, Bombay and Calcutta. Delhi, Ootacamund and Monghyr in Bihar, are other centres of organized dairy industry. Efforts are now being made to give it a rational footing so that with the rising standard of living of the Indians more milk and milk products are made available.

3. SHEEP REARING

Sheep is an important animal and, as has been said earlier, it is reared for the sake of its meat as well as the more important product wool. Sheep which yields meat is not a good producer of wool. But the great quality about sheep of both the types is that this animal can live on short grass and can go for its food to great rugged heights. Therefore, we find that grass covered slopes of hills are very good sheep rearing districts. Normally those areas, which have a greater amount of rainfall, are best for mutton sheep, which does not require any outside fattening agent. Sheep rearing for the sake of *mutton* is very important in New Zealand, Australia, Argentina and Uruguay. In these countries, the sheep is not kept for wool and its wool is worthless. New Zealand is paying special attention to the development of sheep rearing for the sake of mutton. Although there is not much trade in mutton, still Argentina, Uruguay, New Zealand and Australia do export because there is not sufficient population to consume at home.

But a more important product obtained from sheep is *wool* on which depends the woollen textile industry of the world. Besides sheep, wool is also obtained from the hair of goats and camels. In South American countries of Ecuador, Peru and Bolivia, the rough surface and a cool semi-arid climate is favourable to certain animals having long hair. The Llama, Vicuna and Alpaca are very good animals producing some very fine and soft, long wool. Goat is also a producer of wool and it can also thrive on poor grasslands and rugged topography. Spain, Algeria, Union of South Africa, India, Mongolia, Central Asia and Asia Minor are the chief goat regions of the world. The Angora goat of Asia minor is world famous for its 'mohair' wool. These goats are now reared in South Africa also. The world famous 'pashmina' wool is also obtained from the hair of a goat found on great heights in north Kashmir.

Conditions under which Sheep thrive—But the most important source of wool in the world is *sheep*. Sheep which yields good wool requires the following three conditions :—

1. Lime-stone soil.
2. Cool dry climate.
3. Mountainous slopes overgrown with poor grasslands.

Before the beginning of the railways and the steamship, wool producing sheep were confined to places in Europe and America. But after the introduction of these fast means of transport, sheep rearing for wool has spread all over and now the southern continents produce raw wool for the manufacturing centres situated in the northern hemisphere. Three factors are responsible for the development of sheep-rearing industry at any place :—

1. The pasture land must be yielding so small grass that cattle cannot graze there and topography must be so rough that

the land might be quite useless for agriculture or such as agriculture cannot be practised with any great profit.

2. The region must be semi-arid and cultivation of crops and other animal industry must not be possible. Sheep can only thrive in cool-dry climate. In hot climates, the sheep do not produce good fleece and often the fleece is altogether absent in sheep found in Cuba and Brazil. In wet climates the sheep reared are good for mutton but not for wool.

3. The third factor why land may be devoted to sheep farming is that the place might be situated so far away from the great markets of the world that the heavy and easily available cheap produce of agriculture cannot be marketed with profit.

Regions of Sheep Rearing and Wool Production—Wool production and sheep rearing has moved down from Europe and America to the countries of the Southern Hemisphere. Sheep rearing yields much better return than cattle rearing. At the present moment, the chief sheep rearing areas of the world are :—(1) Australia, (2) Laplata Valley of South America and (3) South Africa.

Sheep is now mostly found in the south temperate zone and the three areas of the southern hemisphere noted above have become the most important suppliers of raw wool. There, sheep rearing is carried on as an industry on commercial scale. These regions of the world have less than 1.5% of the world's population but they have about 40% of the world's total sheep population. These regions again combine the qualities of remoteness, semi-aridity and sparse population. The idea of sheep population can be had from the fact that there are on an average 6 sheep per person. Often very great care is taken to look after flocks of sheep as it is a stupid animal and the herder looks after his flocks with the help of his dogs and horses.

Australia—Australia is the greatest producer of wool in the world. 1/4th of the total world production is obtained from this region. Sheep-rearing is carried on in the whole belt extending from the Murray basin in the south to central Queensland in the north. The sheltered mountain slopes and plains are the great sheep areas. The eastern coastal plains are often very wet for sheep culture. New South Wales, Queensland, Victoria, West and South Australia are important sheep rearing areas in this region. Australia has nearly 105 lakh sheep in all. New South Wales possesses nearly 1/2 of the sheep of Australia. There are certain difficulties in the way of sheep rearing in Australia. Sheep is to be protected from the wild dog—Dingo, and the attack of certain flies and insects. The rabbit is also a great enemy of the sheep as it eats away the grass meant for the sheep. The arid nature of the country and the irregular character of the rainfall are other important handicaps in the way of sheep rearing.

Argentina and Uauguay—These two countries of South America occupy the valley of Laplata river and are the main centres of sheep rearing industry. Merino sheep has been brought from Spain and bred here. The greater heat and rainfall render North

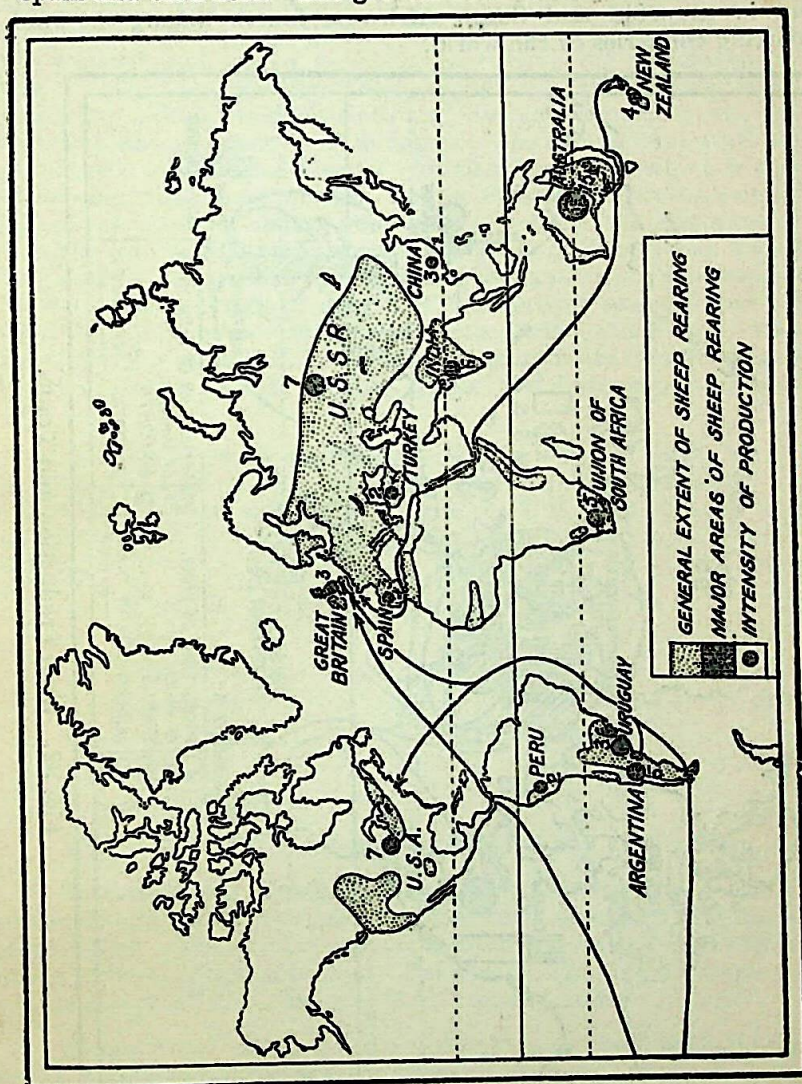


Fig. 31. Areas of sheep-rearing in the world.

Argentina more efficient for cattle but towards the cold south, the plains of Patagonia are important as sheep-ranges. Uruguay devotes 20 times as much land to sheep rearing; and wool and mutton from 95% of the exports form this country.

South Africa—Here the same topography and climatic conditions prevail as in Australia. It is mainly a wool producing

region and the export of wool has a very important place in the development of the economy of this country. During the last 20 years, the number of sheep has doubled. Sheep rearing is concentrated on the eastern plateau of the Cape province. Most of the wool is exported and South Africa is fourth among the wool exporting countries of the world.

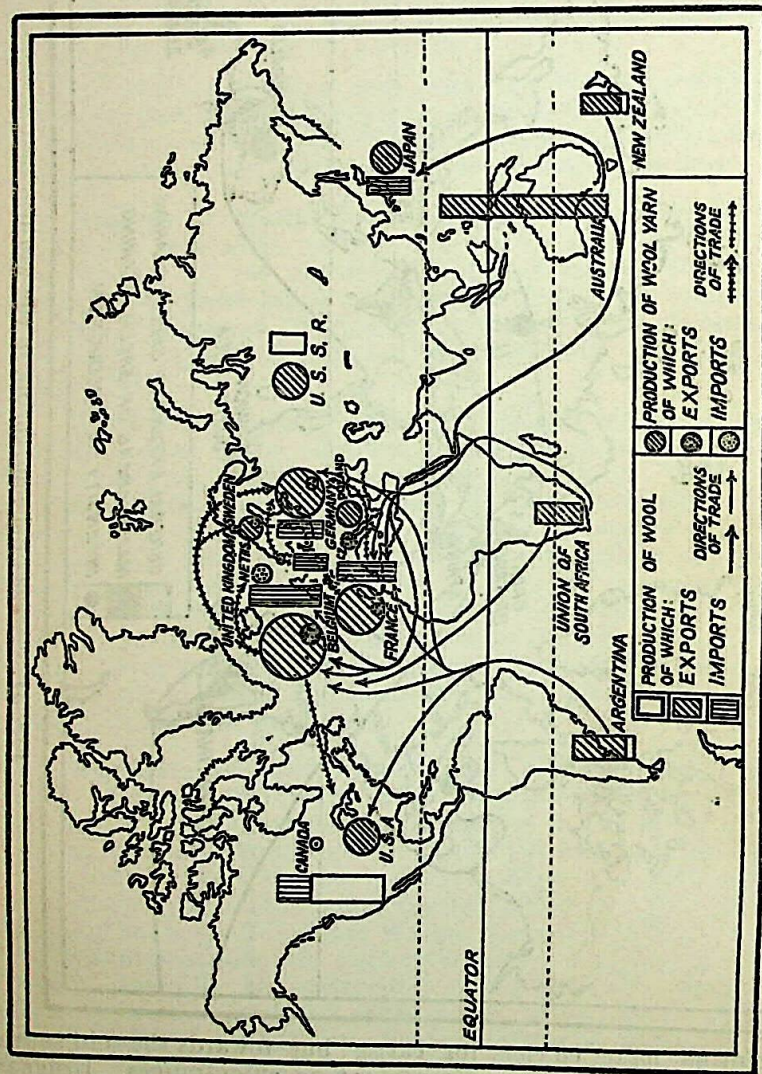


Fig. 32. Wool Production and Trade.

Other Areas—In the U.S.A., sheep is reared in the western part and in the Texas. On the Penine ranges of *England*, sheep rearing is an important occupation. Merino sheep is an important animal of the *Spanish* plateau. Sheep is also found in *Afghanistan*,

Asia Minor, hilly regions of India and China, but their wool is raw and coarse and is not fit for international trade.

Raw Wool Production—The fleece as it comes from the sheep has impurities which amount to half or three-fourths of its total weight. The impurities in wool are dust, sand, burrs and other seeds of plants etc. Before being spun it is washed, scoured, combed and carded in order to remove all the impurities from it. Wool is generally of two types—the finer variety which is used for making woollen cloth and the coarse variety which is used for making carpets and druggets. The commercial wool can be classed under three divisions : (a) *Combing wool* which is used for making the finest clothes and is chiefly the product of the Merino sheep ; (b) *Clothing wool* is coarser than the first one and is chiefly grown from many sheep of English and American breed ; (c) *Carpet wool* consists of the coarse harsh wool produced in countries where breeds of sheep are unimproved and the flocks ill cared for. Australia, Argentina, South Africa, Uruguay produce the combing wools ; U.S.A. and Great Britain are important producers of clothing wool. Russia, China and India produce carpet wool.

The world wool production reached a record 6136 m. lbs. in 1969-70 against the previous season's 6,113 m. lbs. The Australian output rose by 4% while the U.K. clip fell by 4%. Australia produced 1/3 of the world total and was followed by Russia.

Australia	2000 m. lbs.
Russia	860 -do-
New Zealand	740 -do-
Argentina	405 -do-
South Africa	331 -do-
U.S.A.	200 -do-
Uruguay	176 -do-

The Total world production in 1969-70 was 3547 million lbs.

International Trade in Wool—80% of the wool coming in international trade is obtained from the countries of Southern Hemisphere. The chief exporters of wool are Australia, Uruguay, South Africa, Argentina and Pakistan. The chief importing countries are—U.S.A., France, U.K. and Belgium.

Hence it is clear that the consumption of wool is the highest in the highly industrialized countries of the cool temperate latitudes. The people of these countries require woollen cloth all the year round and according to the standard of their living and nature of work, they consume the greatest amount of wool. Recently, the use of artificial yarn has given a great set back to the woollen industry. But still during the 1969-70 season, the

world wool consumption rose a further 2.4% to a record 3531 m. lbs (Clean). Consumption in the developed countries was about 5% higher than the year before although below the 1966 record. While in the U.S. and Britain, consumption fell by 5 and 2 percent respectively, France, West Germany and Italy recorded rises of 12 per cent. Consumption in developing countries was estimated to have risen about 2½% between 1968 and 1969. In communist countries available stocks of raw wool declined. In 1969 Japan emerged as the largest user of wool in the world, replacing Britain in that position. It consumed 6% more wool than before.

The countries of the southern hemisphere contain very little population and the main occupation of the people there is agriculture. As such, no woollen industry of any great significance has developed there. Raw wool is, therefore, exported and the direction of trade is from south to the north—from the countries of the Southern Hemisphere to the industrialized countries of Northern Hemisphere. The high value of wool causes the cost of transport to be but a small percentage of the total cost of the wool bale at the mill so that the place of production has but little influence upon the place of manufacture. More than 1/2 of the world's wool is consumed in the countries other than those where it is produced. The wool manufacturing centres are situated in Western Europe while the raw wool producing countries are found in the Southern Hemisphere. 50% of the world's wool goes to Europe and 46% to the U.S.A.; Australia, South America and South Africa account for 80% of the world's total export of raw wool.

Future Prospects—Consumption of virgin wool in the wool textile industry in the seven major manufacturing countries, excluding Australia and Belgium, has not kept pace with production. The widening gap between production and consumption created larger stocks of raw wool in five consuming countries, excluding Belgium.

As wool has always been a world commodity, the future of the industry is reflected by world conditions. Generally the outlook for merino and crossbreed wool is good. The favourable factor are that,

1. World population is increasing steadily, particularly in areas of high living standards, and should lead to a higher consumption of apparel.
2. Efforts to improve living standards in Asia and other backward countries should lead to a gradually rising demand.
3. High employment policies in many highly developed areas should result in wool consumption generally being higher than in pre-war years.

4. Expansion of woollen textile industries in wool-producing countries and in some smaller European countries has tended to increase total demand in those areas. The recovery of woollen textile industries in important consuming countries—Germany and Italy and lately, Japan—has contributed to a strengthening of total demand.

5. The defence programmes of the Western democracies have promoted a high demand of wool fabrics for the forces and have maintained a high level of economic activity.

On the other hand the unfavourable factors stem from the competition of other fibres.

1. Production of rayon yarn and synthetic fibres continues to expand and can be expanded without increased productive capacity.

2. Expansion of the productive capacity of new fibres is proceeding at a faster rate.

3. Manufacturers of rayon and synthetics spend vast sums on research and publicity.

4. A number of fibres have qualities superior to wool for specific uses, although none approaches wool through the full range of uses.

5. A number of fibres have been blended successfully with wool.

6. If the need for defence stockpiles of wool disappeared, their release could depress the market.

The task of the wool industry is to maintain adequate and payable markets in fields where its unique qualities are in particular demand. Recent experience suggests that wool can compete favourably so long as the price is right. But there seems little chance that wool can, in the long run, escape from an intensification of competition with the newer fibres particularly as their output rises and prices become more keenly competitive.

CHAPTER XI

Energy

To help him in his work, man draws on many energy sources : his own muscle, animal, wind, water, sun power, the mineral fuels and more recently, atomic energy. It is useful to distinguish between fuel and energy. Fuel is any material which is used to produce energy. For instance, coal is burnt to produce steam or electricity ; coal is a fuel while steam or electricity is a form of energy. Wood, charcoal, coal, lignite, alcohol, petroleum, oils, natural gas, uranium and thorium, etc. are different kinds of fuels which are used to produce energy. The sources of energy are manpower, animal power, wind, running and falling water, steam power, tidal power, thermal energy, solar energy, etc.

In primitive days, production depended to a large extent on human muscular energy. Slaves were used to carry loads, water and to plough with animals. Necessarily, total as well as per-capita production was low. Gradually, wood, wind and water became the sources of power. This was the position till the middle of the 18th century, when the steam locomotive was recognised as an efficient means of transport. Steam and coal brought a far-reaching industrial revolution in America and Europe. The introduction of petroleum as a source of power in 1860 was highly significant and the production and distribution of petroleum and its products has revolutionised economic activity. Another important event in the industrial sphere was the introduction of electricity into the commercial field. When long distance transmission of electricity became practicable, a new stage in industrial progress began. It helped in the decentralisation of industries. Atomic energy, which is the latest in the series, has brought into the world the most revolutionary force since pre-historic man's discovery of fire. The potentialities of atomic energy are tremendous as one ton of uranium can produce as much heat energy as supplied by two to three million tons of coal. The extensive use of atomic energy will naturally bring about tremendous changes in industry and transport. A word may be added about solar energy which is regarded as a major energy resource in the near future. It is estimated that the sun supplies the United States of America 16,000 times as much heat as utilised in

that country at present. If the solar energy can be harnessed for the benefit of man, there will be a revolutionary progress in the world.

1. IMPORTANCE OF ENERGY

The significance of energy can be understood from the fact that life in all technically advanced countries would be impossible, but for the abundant supplies of power. All of us are aware of the extremely unpleasant effects of power cuts and power failure—in summer months failure of power can mean extreme discomfort to people. Power is very important for manufacturing industries, for all the machines are run by power. The more developed the power resources, the more extensive will be industrialisation. Besides, the location of factories, till recently, was influenced by the availability of power specially coal. The development of electric power, and the use of petrol have helped in the setting up of factories and workshops in any part of a country. But, by and large, even now industrial location is influenced by the availability of power.

Even agriculture is requiring increased quantities of energy. There was a time when most of the agricultural operations were conducted with the help of human and animal power. This is the position even now in under-developed and backward countries. But in most advanced countries, agriculture depends upon petrol and electricity. The modern farm requires petrol and diesel for its tractors and harvestors; and it requires electricity to operate its pumpsets and tubewells.

The importance of energy for the transport system can be easily understood for every mode of transport requires some form of energy. The more developed and sophisticated the transport system, the more advanced the energy fuel which is required. In the 19th century, transport and trade were revolutionised by the use of steam in railways and shipping. Petrol made the internal combustion engine popular and the automobile industry became the basis of a new transport revolution. Now electricity has been responsible for tremendous change in the system of transport. A revolution in transport automatically brings about a revolution in trade and commerce. Apart from the tremendous expansion in trade in the last two hundred years or so, there is also an enormous expansion of trade in petrol and petroleum products. The prosperity of the middle East Countries is based on exports of oil.

2. ENERGY CONSUMPTION AND ECONOMIC DEVELOPMENT

The demand for energy is almost unlimited and is increasing day by day. Industrialisation and economic development is often expressed in terms of energy consumption.

In 1960, Professor Nathaniel Guyol demonstrated the close relationship between energy consumption and gross national product. Studies by the wellknown economist E.A.G. Robinson have shown that for every 2 per cent increase in energy consumption in the world as a whole, there has been a three per cent increase in industrial output. At the outset, we should emphasise two points. First, per capita income tends to be more closely associated with per capita energy consumption, than with per capita energy production. Per capita energy production is high in the Middle East oil states, but per capita income in many of them is very low. Second, the production of energy resources tends to decline in relative importance as nations become more advanced economically. But upto a certain stage, as economic development proceeds and national income rises, energy utilisation also grows. There is a direct co-relation between per capita income and per capita energy utilisation. This is obvious from the following table.

Table XI : 1—Energy Utilisation per capita

<i>Country</i>	<i>Energy Utilisation per capita measured in tons of coal equivalent</i>	<i>per capita income (Rs.)</i>
U.S.A.	8	12,000
U.K.	8	4,500
Japan	1.5	1,540
India	0.28	300

One of the most important features of the period since the Second World War has been the tremendous growth in the demand for energy in various parts of the world, specially for petrol and electric power. Not only the rate of growth has been rapid, but it seems to be accelerating. In 1937 world demand for energy in its various forms totalled 1,910 million metric tons of coal equivalent. By 1949 they had increased to 2,360 million metric tons of coal equivalent.

As the demand for energy in its various forms has increased, the supply pattern of energy has broadened. At the turn of the 19th century, most industrial areas depended upon the local supplies of energy, viz., coal. The coal field and the hydro power stream were major location factors. Advances in technology and the discovery of new sources of energy have increased locational flexibility *vis-a-vis* energy supplies. Energy now moves over thousands of miles in its various forms, and is transported by a wide variety of media. Moreover, most centres of consumption have now several alternative sources from which to choose instead of only one.

Important energy-consuming nations may or may not have major resources of energy minerals, and major producers of these minerals may or may not be large consumers of energy. Thus, some areas are major importers or exporters of fuels. The resulting trade in energy minerals between nations is greatly influenced by political conditions; so also are the production and use of such fuels, specially petroleum and natural gas.

Technological changes can modify significantly the competitive position of various types of fuels. For example, the development of oil fields in Gujarat may modify the present pattern of energy production and consumption in northern and central India. Again, technological changes may bring about a shift in consumption from one type of energy to another. In the last 20 years railways have declined as a major consumer of coal, because of introduction of diesel engines.

Changing Patterns in Production and Consumption of Energy—Since the Second World War, the production and use of energy have been characterised by the following distinct but interrelated features :—

(i) Production and consumption of energy have approximately doubled. It is estimated that the current annual rate of increase of energy consumption is about 5 per cent. The general opinion based on recent trends is that the demand for energy will double itself during the next generation and that by around 1980 A.D. the world will be using something of the order of million tons of coal equivalent.

(ii) The relative importance of petroleum and natural gas has increased at the expense of coal. However, the significant forms of energy in the future could be nuclear energy and solar energy.

(iii) The relative importance of the various energy producing and energy consuming areas has changed. The United States of America for instance, which was a giant in both respects has experienced a slower growth in recent years than have some other parts of the world; and its share in world total has, therefore, decreased. The Middle East, North Africa and Soviet Union have entered the oil map of the world as the leading producers of petrol.

(iv) Governments have been taking growing interest in the development of energy resources in recent years because of the assumption that the energy resources development is a major requirement for economic growth. Governments are constructing and operating power dams, transmission lines, thermal power stations, pipelines etc. In India, for instance, the Government of India owns and operates oil, electric power industries and atomic energy plants. Investment in the development of energy resources

accounts for a large proportion of total investment in countries like India.

(v) There has been growing international cooperation in the technical and financial fields in the development of energy resources. World Power Conference, the International Conference on Larger Electrical Systems and International Union of Producers and Distributors of Electricity existed even before the Second World War for promoting technical cooperation between countries. After the Second World War many more international agencies have been set up to promote exchange of technical information. Growing financial cooperation between countries may be seen from the construction of joint venture projects by countries which would benefit directly from them. World Bank and the Colombo Plan have been promoting financial co-operation in the development of power resources.

(vi) Because of improved technology, huge projects in the field of energy have been coming up, some of which were not even visualised before the Second World War. Huge dams of over 600 or 700 feet in height are becoming very common. Before the war, Grant Coulee in the U.S.A. was the largest generating plant with an installed capacity of 19,44,000 kw., but there are larger plants now in Soviet Russia and North Africa. Huge oil gas pipelines, huge conveyer belts to carry coal to power stations, huge oil tankers more than three times the size of those built before the war—these and many more have made it possible to produce and transport more energy and at cheaper rates.

(vii) Finally, there has been tremendous increase in the volume of energy, transferred between countries. This is partly due to (a) increase in the demand for energy, (b) the decline of local sources of supply and (c) the discovery of new lower cost sources of supply. The increase of transfer of energy has been made possible by improvement on the technological front and by the relaxation of trade barriers.

3. SOURCES OF ENERGY

With the development of the economic life and activity, when man started manufacturing goods from the resources of nature, he felt the need of some sources of mechanical power. As a matter of fact, in the development of manufacture and in the evolution of civilization, the possession of some source of mechanical power is a much more potent factor than any thing else. At the present moment, every nation of the world wants to develop industries and to that end in view it tries to establish mills and factories. Presence of fuel is the back-bone of this effort. If a country does not possess any source of power, it is likely to collapse in the same way as happened in the case of Italy. "For want of coal her industries stopped; for want of shells her guns were spiked and for want of guns her armies were powerless."

Chief Sources of Industrial Power—Nature has provided man with certain very important sources which can be used as fuel and which are, at present, the sources of industrial power. Running water, wind and solar energy are very old sources from which man can get energy. Man has been using these sources of industrial power and we know how water mills and wind mills work. Along with this, animal and human power has also been utilised as a source of power. Man still burns wood in order to get energy but all these sources of power are now out-moded and obsolete. At present, the chief sources of industrial power in the world are *coal, petroleum or mineral oil and water power or hydro-electricity*. Petroleum takes along with it *natural gas* also. These sources of power of mineral fuel, as coal and petroleum are called, are used not only for power development but also as basic raw materials in industries.

More than $1/2$ of the world's energy comes from coal and nearly $1/3$ rd from crude petroleum. In 1968, energy produced from all sources amounted to 4,311 million metric tons. Consumption per head in 1968 was 1,405 Kg. averaged over the whole world. North America produced $1/3$ of all the world's energy and per capita consumption in this region was 7,802 Kg. In Western Europe, 90% of all energy came from coal.

From the point of view of commerce and industries, *coal* is the most important source of energy. Its importance is felt by the industry, mining and transport. The greatest quality about coal is that it is found more extensively than mineral oil and it yields valuable by-products. Coal-tar, bitumen, gas, soft-coke, crude-oil, benzol, burning oil and sulphur are some of the important by-products. Then there is another great advantage. Coal comes from the mine ready for use. It has not to be refined like crude oil. That is why coal has been described as the mother of industry. Modern industry is born and nourished on coal. It provides the modern factories with the cheapest fuel. Even though coal is still widely used in the industries, its popularity has suffered with the emergence of mineral oil and water power.

But the occurrence of *mineral oil* is limited to certain special areas and often a lot of extensive prospecting is required before oil wells are discovered. Then the oil has to be refined and for that matter, first transported to the refineries where it is refined and made useful for use. That is why, most probably, mineral oil areas of the world are not the seats of any great industries.

Petroleum or mineral oil is mostly used in means of transport and its importance came into the forefront with the invention of the diesel engines. Refining of mineral oil yields a number of by-products which are the basis of petro-chemical industry. Then it has a great advantage of being carried easily and conveniently through pipes, because it has more energy than weight. In transport, *oil* is a very serious competitor of *coal*. As far as heavy

industries are concerned, coal remains the basic fuel. Because of the comprehensive utility of coal, it is more than apparent that in years to come, coal will continue to be in great demand. As a matter of fact, 50 years ago, when the use of petroleum and water power started, it was suspected that gradually coal will lose its importance but facts have proved beyond doubt that in spite of these two sources of power, coal continues to be very important and in great demand.

Both coal and petroleum are mined from underneath the earth and howsoever carefully we may take them out, we do find that by doing so, we shall be consuming the resources existing under the earth and a day will certainly come when these reserves will be exhausted. As the industrialization has developed in the world, the consumption of coal and petroleum has also gone up and the world has been thinking of some alternative source of energy.

Water power or hydro-electricity is the alternative source which has inspired hope in the hearts of the world. Water power came into use since the invention of the new turbine and pelton water wheel and the ability to transmit power in the form of electricity over many miles to a convenient place of consumption. The greatest point about water is that it is in no way a robbery on nature. Water which produces electricity is not consumed or lost in the process. Then, water power has made it possible for the different regions of the world to develop industries where so far no development had taken place in the absence of coal and petroleum. The development of wood pulp, paper and rayon manufacture in the world has been possible only because of water power. But water power requires certain essential conditions, both natural and economic, for the sake of development. The presence of these conditions along with ease of construction, effectiveness and permanence of well-built dams has greatly influenced the water-power installations.

Water power holds a great scope for the world because this source is never to be exhausted and it is never destroyed. There is not only inexhaustible store of hydro-electricity but also in the production of 1 H.P. of hydro-electricity, there is a saving of 4 tons of coal. It is no doubt true that in many countries, like Norway, Switzerland, Finland, Canada and Sweden, industrialisation and economic development has been possible only on account of hydro-electricity. But in those regions, where both coal and hydro-electricity exist, only that source of power is more utilized which is available easily and cheaply.

Recently a new source of energy has come to the fore. After the Second World War, the world has been talking about *atomic energy* and its application for peaceful purposes. But one thing is certain that howsoever wonderful or extensive development might take place in atomic energy generation, it is definite that neither

the world reserve of uranium, which is the basic material for atomic energy, is so great nor its generation so cheap, as to eliminate coal from the field of the sources in industrial power.

The share of *nuclear energy* in the world power engineering balance has so far been rather insignificant, and a very rapid development of nuclear energetics as anticipated has been problematic on account of the rather unprofitable nature of atomic power stations compared to conventional power stations. Specialists have estimated the share of nuclear energy in the world power engineering balance to account for 25 per cent by 2000 A.D. All the same on account of the tremendous growth in demand for energy it is rather difficult to presume that those needs will be entirely met by crude oil and gas.

4. COAL

Coal usually lies in several strata or "seams" being deposited at successive periods. The seams may vary in thickness from a few inches to many feet. These seams of coals lie between other rock deposits of the age in which they are laid down and these rock deposits are known as 'coal measures'. These may be sandstones, iron stones, clays, all sedimentary deposits.

The process of laying the major coal seams of the world took place in definite geological times. The most notable of all such periods is that known to geologists as the carboniferous period or the coal measure times. The great coal bearing rocks of Europe and Eastern N. America were laid down during this period. The coal seams of India and the Southern Hemisphere were formed partly in this and partly in the succeeding Permian period and are referred to as being of permo-Carboniferous age. These two systems contain the great bulk of world's coal.

The reserves within 6,000 ft. of the surface are estimated at approximately 8,000 million tons, an amount large enough to last the world approximately 4000 years at the present rate of consumption, allowing 1/4 of the coal to be lost because of poor methods of mining.

We may divide the world's coal into two systems on the basis of the age in which they were laid down: (1) the *Carboniferous system* (2) the *Permo-carboniferous system*. Even though coal is widely distributed, greater part of its production is confined to three countries—U.S.A., Great Britain and Germany. Roughly speaking the production of coal is almost confined to the North Temperate Zone, more still, to the countries bordering the North Atlantic. Production outside this zone is insignificant. The most striking feature of the world distribution of coal is the way in which all the major reserves are clustered along or near the 50° Isotherm. Almost 90% of the total coal reserves occur in the seven countries—U.S.A., Canada, China, Germany, United Kingdom and

Australia. Among the minor producers, the important ones are Japan, Belgium and India.

The largest production of coal mines in the world comes from countries where the January temperatures are about 40°F. 90% of the world's coal comes from such countries and in North America and Europe, the coal bearing belt lies between 10°F. and 40°F. January Isotherms. In other words, we may say that the production of coal is almost confined to the temperate zone in the northern hemisphere, North America and Europe being the most important regions. Outside this region, production is almost insignificant. Japan, India and China are the only important producers outside this region. Japan produces only 3% of the world production while India and China produce 2% each. As a matter of fact, the production of coal in Asia, Australia, Africa and South America together is not even as much as that of one single country in Europe, *i.e.*, Germany.

Varieties and Yield of Coal—The value of coal as a fuel depends upon the carbon content in it. According to the percentage of carbon, coal has been divided into 5 categories :—

1. *Anthracite coal*—It is the hardest and takes time to light or catch fire. The carbon content is as high as 95%. It has very little dust, gives out no smoke and leaves very little ash after burning. The heat content is sufficiently high and it is of the best quality.

2. *Bituminous coal*—It has a carbon content varying from 70% to 90%. It contains a lot of gas and tar. It, no doubt, burns easily but gives lot of smoke and leaves behind plenty of ash.

3. *Gas coal*—It has about 40% carbon but, as the very name suggests, the amount of gas and tar is very much higher. As such, it gives a lot of smoke.

4. *Lignite*—It is brown in colour and has got very low heating power. The carbon content is sometimes as high as 45%. The tar content is, however, less than other varieties.

5. *Peat*—Peat is half way between wood and lignite. It has a high amount of wood content and, as such, it shows that it is the formation of that vegetable matter which has remained under the earth for a comparatively shorter period of time. This burns like wood, gives out plenty of smoke and its heating power is also very low.

Uses of Coal—Coal is a very important means of power and its importance as a fuel increases when we see that world's commerce is coal driven and world manufacture is chiefly in the steam driving factories. Coal as a fuel has to be turned into coke before it could

be used in the heavy industry. Iron and steel making specially requires coke, which is made by heating coal in closed retorts where the gas and liquid-matter are driven off as vapour and harder lumps are left behind. In the process of coke-making a lot of gas is given off which, on being distilled, yields several pounds of ammonia and several gallons of tar per ton of coal. In this way, we find that valuable by-products are yielded in the course of treating coal. The five general groups yielded per ton of coal are given below :—

Coke.....	380 lbs.
Tar.....	9 gallons.
Ammonium Sulphate.....	23 lbs.
Light oil.....	3 gallons.
Gas.....	11 million cu. ft.

Sulphur is one of the miscellaneous products obtained from coal. The light oil can further be made to yield Benzol, Motor Benzol, Toluol, Naphtha and Xylon. The fine broken coal is also utilized by making into bricks and they have a good export market in those countries where low grade coal is found.

World Reserves of Coal—The world reserves of coal are sufficient to last for a few generations or in other words for at least one to two thousand years. The coal reserves according to the continents is given below, in billion metric tons :—

North America	4,149.4	Africa	230.7
Europe	2,440.9	Australia	173.5
Asia	1,167.6	Central and South America	3.2

But at present the production of coal is limited to only a few countries. 75% of the world's coal is mined in those countries where 12% of the population lives. Another point that emerges from this study is that coal reserves are not equally well distributed through-out the world. North America contains about 60% of the total world reserves. Asia comes next with about 17%. Europe comes third while Africa and South America are extremely poor. The U.S.A. alone has about 1/2 of the total world reserves and while Asia ranks second, her reserves are situated far from the market and suffer for want of transport facilities. Europe, which has less reserves of coal, has the advantage of their being situated near the consuming markets.

A conservative estimate places the world reserves of Bituminous coal and Anthracite at 46,85,000 million tons. Of this U.S.A. U.S.S.R. and China account for a lion's share of 31.5%, 25.6% 21.3% respectively. Others in the line are S. Africa (4.2%), U.K.

(3.5%), Poland (2.3%) and West Germany (1.6%). India accounts for roughly about 1.6% of this reserve.

Main Coal Producing Areas—45% of world's energy production comes from coal.

U.S.A.—U.S.A. produces 20% of the world's coal and coal mining is carried on in the following three regions :—

- (1) Appalachian Region ;
- (2) Central States and
- (3) Rocky Mountains.

Appalachian coal mines extend from Pennsylvania State to Alabama State. Pennsylvania region produces high quality Anthracite and it has the further advantage of being very near the cities of the Atlantic Sea Board. It has further the advantage of being within the reach of the Great Lakes transportation system. Throughout its length, the river valleys open from east to west and these provide an easy access. The coal found in the Pittsburg area is of the highest grade and is most suitable for the manufacture of coke and gas. Close-by the Anthracite coal seams, we find a very good quality of bituminous coal which continues from north to south. Alleghany-Kentucky plateau is the most important bituminous coal region. Towards the south in Alabama, it is accessible from adjacent markets. Further, it has the advantage of Warrior river cheap transport system. In eastern Kentucky, 10,000 sq. miles are under-laid with coal but no large development has been possible because this region is badly cut up into gorges and, there is little facility of transport. The region produces 5% of the coal of U.S.A.

The interior coal fields are found in the Central States of Iowa, Kansas, Illinois, Indiana, Missouri, Dakota and Nebraska. The coal found here is of the bituminous variety and as one moves from east to west, the quality of coal declines. The output here is greater and the central industrial region depends upon this coal.

The Rocky Mountain States have extensive deposits of coal but they have not been fully utilized so far. Population is very sparse because of which the coal resources have not been fully explored.

The U.S.A. produces 39% of its energy from coal and all coal produced within the country is consumed so that there is very little export outside. 430 million metric tons of coal are produced, the largest quantity in the world.

China—China has very extensive deposits of coal situated in the north-western part of the country where the population is sparse. Important minerals are absent and the cheap river

transport is not available. It is estimated that the total coal reserves in China amount to 445 billion tons. The coal is of the finest Anthracite quality and although some amount of coal is found in each and every province of the country, the chief coal bearing areas are Shanshi, Kansu and Honan. In 1962, it is estimated that China would achieve the target of 2,800 lakh tons in coal production. The Loess region of China contains about 90% of the national coal reserves. South Manchuria and North Hopei are other important coal producing areas of China.

U.S.S.R.—Soviet Union occupies the second position among the coal producing regions of the world. The annual production of coal is more than 3,800 lakh metric tons. It constitutes 2/3rd of the entire fuel balance of the U.S.S.R. The most important thing about Soviet coal production is that it has had exceptionally rapid growth. This was done by means of highly scientific techniques and mechanisation besides exploitation of new fields. The most important coal regions of the U.S.S.R. are :—

1. Kuznetsk region in western Siberia.
2. Tumguz, Skutsk, Nonvas and Pichora in Thanasey valley.
3. Burin in the Amur Valley.
4. Karghanda basin in the Central Asian Republics.
5. Moscow, Ural, Transcaucasia and Donetz basin in European Russia.

As a matter of fact, Donetz basin is the most important coal bearing area and covers about 16,000 sq. miles. Next comes Kuznetsk basin in Western Siberia. Third in importance is Karghanda basin. It is estimated that the coal reserves in the U.S.S.R. amount to about 100 million metric tons. Coal production in the Kuznetsk coal basin is to double by 1980 and it is estimated that production costs will drop by more than a third. Here lies one of the world's richest deposits of high quality coal. The deposits are estimated at 2,70,000 billion tons to a depth of 600 metres alone. Some seams are 25 metres thick. The basin has practically every grade of coal. It is hoped that by 1980, coal production from this basin will rise to 220 million tons per year.

U.K.—Great Britain occupies a very important position among the coal producing countries of the world. The coal bearing areas in this country have two very great advantages. The first is that coal and iron-ore are found close by and the second is the nearness of the coal mines to the sea so that there is facility of cheap transport. The most important coal areas, whose reserves amount to about 4,30,000 lakh tons, exist on both the flanks of the Penine range which runs like a backbone from north to the

south. The following are the most important coal bearing areas :—

1. Clyde valley, Iyrshire and Firth of Forth in Scotland. This area is very well served by river, canal and rail transport.

2. Northumberland and Durham area produces the largest amount of coal and the quality is fine anthracite. Most of the coal is mined near the coast and, therefore, it is easily exported. New Castle-On-Tyne is the most important coal town. Iron foundry and steel mills have also developed nearby.

3. On both sides of the Penine range and to the south of the Penine range, coal bearing beds are found. Lancashire in the west, Yorkshire in the east and Midland area consisting of north Staffordshire, South Straffordshire, Liecestershire and Warwickshire to the south of the Penine range are the most important coal areas of the Penine region. Coal is easily mined here and the quality of the coal is also quite good. The occurrence of coal has led to the development of several industries, the most important being cotton textile industry in Lancashire, woollen textile industry in Yorkshire and heavy engineering, steel and watch-making industries in the Midland region.

4. Wales coal region is also of great importance and yields anthracite coal. Most of the coal is exported but nearby, tin-plate manufacturing industry has developed. Swansea, Cardiff and New Port are important names in this connection.

Great Britain has been exporting coal and occupies a very important position in coal production. Now-a-days, intensive work is going on to improve working conditions and production from the coal mines and it is hoped that Britan will be able to produce 2,500 lakh tons of coal by 1970. In 1968, the total production amounted to 209 million metric tons.

North Western Europe—Germany, France, Belgium, Netherlands, Poland and Czechoslovakia are other important coal producing countries on the continent of Europe. But the two most important coal bearing regions are :—

1. Ruhr basin or West-phalia in Western Germany.

2. Silesia-Moravia-Cracow coal field in Poland and Czechoslovakia.

Besides these two, which produce bituminous coal, Saar region of West Germany is also an important coal producer. The coal resources of France and Belgium, even though of good quality, are insufficient in quantity. France is specially poor in coal and has to import from outside. Several parts of East Germany have rich deposits of lignite which is now being utilized.

Poland is known as a coal power. In 1966 the extraction of coal amounted to 19 million tons of pitcoal (3 million tons more in 1967). So, Poland occupies the sixth place in the world coal

output after U.S.A., U.S.S.R., People's Republic of China, Great Britain and Federal Republic of Germany. Polish coal extraction constitutes around 6 per cent of the world production. The Polish coal reserves amount to 85 billion tons to 130 billion tons at a depth of 1200 meters. The reserves which have been explored and found ready to be extracted amount to 35 billion tons; most of it is being composed of highly valuable power engineering, gas and coke coals. Moreover, 40 billion tons of rich brown coal are traced at a depth of 400 meters.

The Polish wealth as far as coal resources are concerned has been accompanied by a petroleum shortage. The intensive researches conducted in Poland for years have not yet resulted in tracing any abundant strata of crude oil. Its extraction amounted to only 400 thousand tons in 1966 and one million tons has been anticipated for 1970.

Other Parts of the World—Outside Europe and North America, coal is found in the following regions of the other continents :—

1. Natal, Cape of Good Hope and Transvaal States of Africa.
2. New South Wales and South Australia.
3. India and Japan, besides China, in Asia. India is very rich in coal deposits and among the producers of the world, its position is eighth. Most of the coal found here is bituminous and is concentrated in the three river valleys to the east of the country. In Assam and Rajasthan, tertiary coal is found but 97% of the total coal mined in India comes from mines found in the Damodar, Mahanadi and Godavari river valleys.

International Trade—Coal is by-far the cheapest form of industrial power today and the general tendency is for the industries to concentrate on the coal producing areas. Coal is a bulky item and, therefore, as far as possible, not much movement is allowed therein. But still considerable amount of coal enters into commerce, specially local commerce, so as to meet the demands domestic fuel, as fuel for railways and in order to meet the demand of industries scattered far and wide. Other wise, most of the coal is consumed in the regions where it is produced. Before the Second World War, only about 1/7 of the total world production entered into international trade.

Among the exporters of coal *Great Britain* occupies the most important position. Germany, Poland and Czechoslovakia also export some coal. Great Britain has a very great advantage as far as export of coal is concerned. Being close to the sea, the transport problem does not present any difficulty and secondly a lot of coal goes from here as bunker without any overhead expenses at all. The ships which bring bulky agricultural and mineral

raw materials to this country come heavily loaded but on their return journey, they carry manufactured goods which are comparatively lighter in weight. Therefore, in order to bring the weight to the proper level, coal is put in the bunkers and goes free of charge. Thus coal is export ballast of Great Britain.

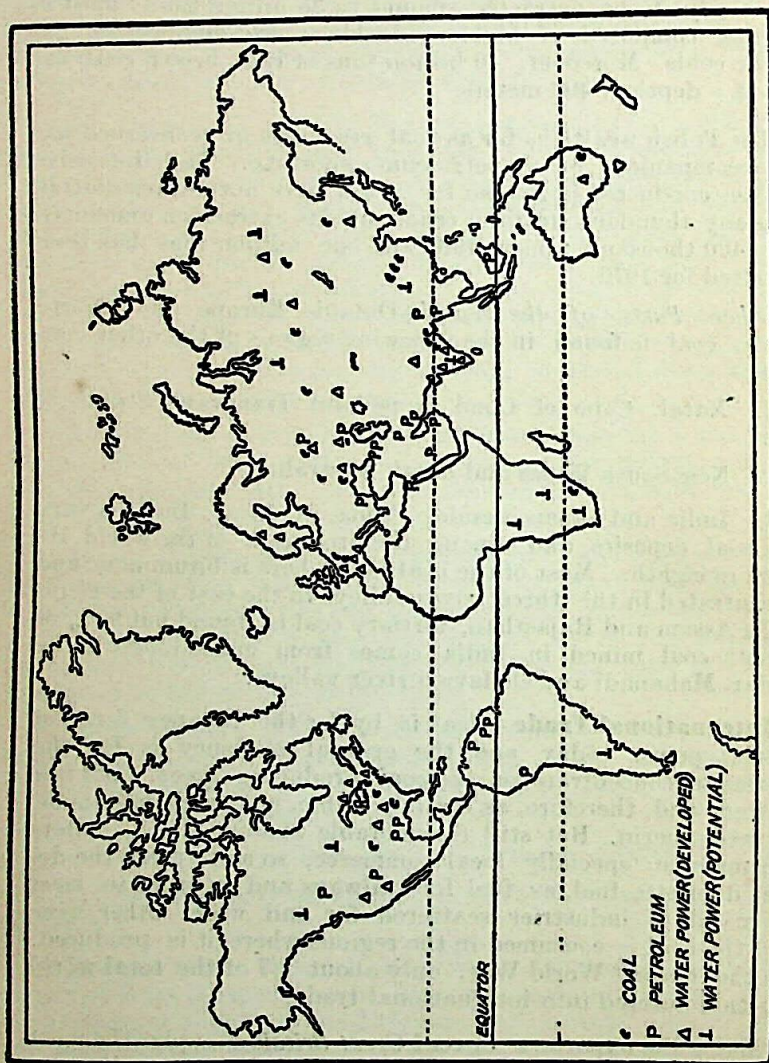


Fig. 33. Power Resources of the World.

The U.S.A. does not export any coal whatsoever. Only 5% of the total production is exported. American coal is more expensive than the British coal because of the following three reasons :—

1. Coal is produced in the U.S.A. 200 miles inland and cost of transportation is fairly high.

2. Europe is the cheap market for world coal and U.S.A. is farther away than U.K. from this market.

3. The export from U.S.A. normally consists of heavy items. Therefore it does not have the facility of utilizing coal as an outward ballast as Great Britain has.

Australian coal exports to Japan have risen sharply in recent years. Australia is now second only to America as Japan's biggest overseas coal supplier. Most of it is used by Japan's steel industry.

The State of New South Wales is Australia's major coal producer and is the main source of high quality coking coal sought by the Japanese.

The most important coal importing countries are France, Italy and Baltic countries. Netherlands and Czechoslovakia also get some coal from outside. It is remarkable that in Western Europe the decline of coal output is incomparably higher than the decrease in the consumption of coal. In some branches of economy, the consumption of coal has been even growing up, for instance in the coke industry and power thermal stations. Such being the case, domestic coal, being rather expensive, is substituted by a cheaper American coal. Consequently we may observe not a firm and rapid abandoning of expensive coal, but a rather notably slower giving up of cheap coal. It confirms the success gained by exports of Polish coal. Poland had exported 17.5 million tons in 1960 and 21 million tons in 1966 including 9.2 million tons to Western Europe. Those exports will amount to 24 million tons in the current year and there is every reason to expect that it will be growing up in the years to come. Outside Europe, the most important importing countries are Pakistan and the countries of South-East Asia. India is an exporter for these countries.

5. PETROLEUM

Petroleum or mineral oil is the name of all those oils which come out of the earth either by themselves or are taken out by means of pumps. It is a liquid fuel and its growth has been very outstanding. It is used not only as a fuel but also provides raw material for chemical and textile industries. It is a very important source of fuel and lubricant and, as such, there is always a great effort among the great powers of the world to keep the oil bearing areas under their control. The importance of mineral oil as a fuel increased after the invention of the diesel engines and it is now being increasingly used in planes, submarines and ships. The numerous uses of petroleum result from the fact that it can be readily broken up into a group of fuels that are equally adaptable to :—

1. Light combustion engine of aeroplanes, automobiles and tractors.

2. The heavier diesel engines used in merchantships, naval vessels and stationary engines.

3. The ordinary hot water or hot air furnaces used in heating the buildings.

Thus it may be seen that mineral oil is widely used except in big industries. The by-products obtained from oil consist of petrol, burning oil, kerosene oil, gasoline, lubricants, vaseline and paraffin. It also yields raw materials used in the manufacture of synthetic rubber, chemicals, medicines and explosives.

Uses and Yield of Mineral Oil—Mineral oil yields a large number of things which are widely used in different industries. But the greatest use is as a fuel. The first great use of petrol was as illuminating oil and then for lubrication. But with the opening of the 20th century, it has rapidly increased in value as a source of power. The world consumption of liquid fuel is estimated to be as given below :

Gasoline for aeroplanes	20%
„ for automobiles	33%
Kerosene oil and Jet oil	6%
Refined fuel	22%
Refuse fuel oil	35%

Vaseline and paraffin are very important by-products which are in great demand in the pharmaceutical industry. The uses of mineral oil are so many that its demand has continuously increased in the world and since 1938, the volume of crude petroleum output has trebled. Of the total world production of crude petroleum, 1/3 is produced in the United States. The Middle Eastern countries produce 1/4th of the world production. Venezuela and the U.S.S.R., are other major producers. Although the production of oil has been going up in the world and every day newer fields are being commissioned, still we find the bigger nations of the world busy in search of oil and they want to keep the oil bearing areas under their control. As a matter of fact, effort to control the sources of oil has been a cause of international friction.

World Reserves—The present total of proved reserves is 53.3 billion tons (taking a billion as 1,000 m.), enough to last for about thirty five years at the current rate of consumption. But this greatly understates the real position. Production techniques are still relatively primitive, and often it is impossible to recover more than 25 per cent of the oil in a field. Efforts are now being made to develop more sophisticated methods, and it is thought that ultimately it should be possible to recover between 50 and 60 per

cent of the oil available, which will double the existing reserves, even if no new oil is found. And there is no doubt that it will be. Although it is 108 years since Colonel Drake drilled the first well at Titusville in Pennsylvania, only about 5 per cent of the world has been thoroughly explored. Both on land and beneath the sea there are still many exciting prospects outside the present producing areas.

On land there are areas, such as 4,65,000 square miles of northern Canada, where vast quantities of oil are known to exist, though the conditions are too rough to justify the expense of a thorough search while there is a world surplus. Drilling in deep water at sea has only recently become possible, and there the outlook is even more exciting. It is estimated that there is 1,00,000 m. tons waiting to be found under the continental shelves and slopes at depths of up to 1,000 feet. Estimates of the amount of oil that will ultimately be found and could be produced cannot be anything but vague. None the less, they provide the only available measure of the opportunities facing the industry. The experts believe that ultimately the total will be about 500 billion tons, excluding the Communist countries, and when these are taken into account it will be much higher. In addition, there are natural gas reserves thought to be about half those of oil.

Even this does not exhaust the full range of possibilities. Further vast quantities of oil are known to exist in the tar sands and shale rocks to be found in different parts of the world. The most famous are the Athabasca tar sands of northern Alberta in Canada, the Orinoco tar belt in Venezuela, and the shale deposits of Colorado in the United States. The cost of production from these "unconventional" reserves is considerable, but research is already in progress to find ways of reducing it. At this stage it looks as if they should add another 360 billion tons to the world total, and it is perhaps significant that the first commercial plant at Athabasca came into operation within a month of the closure of the Suez Canal in 1967.

Main Areas of Production—Most of the oil-bearing areas of the world are found in level plain areas which are made of young sedimentary rocks. Plateau areas of old rocks are generally deficient in mineral oil. That is why Africa, South India, Brazil, Scandinavia, etc. are without any oil reserves. Another point worth mentioning in this connection is that almost all the oil-bearing areas of the world are isolated and situated at a distance from the main industrial zones. Therefore, there is a good deal of international trade in crude oil. Oil producing countries export while industrialized countries import. The oil-bearing areas of the world exist in the following three belts :—

1. The American belt which runs from north to south through North and South America and includes the Central states of U.S.A., California, Mexico and Venezuela.

2. Middle eastern belt which includes Iran, Iraq, Saudi Arabia and the oil deposits of the U.S.S.R. and Rumania.

3. South-east Asian belt which spreads from Assam through Burma to Indonesia.

U.S.A.—U.S.A. is first among the producers of the world while Venezuela ranks third. U.S.A. contributes 25% of the world oil supply; 32% of the world oil reserves are also found here. Oklahoma, California, Texas, Kansas, Louisiana, Illinois, Pennsylvania, Ohio, Western Virginia and Kentucky States are the most important oil bearing areas in the country. The oil of the Western States is heavier and it is used for lubricating machines, while the light oil of Pennsylvania is utilized for making gasoline and vaseline. The U.S.A. is one of those fortunate countries who possess large quantities of petroleum which they require also. The petroleum consumption in the country is also very high. Petroleum accounts for about 40% of the total energy consumption in the country and the annual rate of increase in demand is 3%. Although the production has been quite high, the consumption has increased tremendously consequent on the development of air travel, road transport, and use of oil in ships. The most important and extensive oil area in the U.S.A. is situated in Eastern Texas. But the oil wells of California are the deepest.

Venezuela—Mineral oil is being taken out from the wells in Venezuela since 1907, although the first important well which began yielding oil was started in 1914. But the real development of the oil mining industry began in 1922, when a very extensive oil bearing area was found near Lake Maracaibo. Venezuela, at the present moment, produces about 177 million tons of petroleum and this oil bearing area round Lake Maracaibo also extends into Colombia. The oil taken out from the wells of Venezuela is transported by road and pipeline to the oil refineries which are situated on the shores. From there, it is despatched to other countries of the world. The most important oil regions of Venezuela are the following :—

1. Eastern shore of Lake Maracaibo.
2. Llanos oil fields of Eastern Venezuela.
3. West of Maracaibo at Conception and Lapaz.
4. Colon in south-west Zulia.

These oil fields of Venezuela are very important for the economy of the country.

Mexico—Mexico, once upon a time, competed with the U.S.A. in oil production but now oil production has gone down so much that at present it occupies seventh position among the oil producers. The most important oil bearing area is the coastal plain in the vicinity of Tampico. The Mexican oil is heavy oil and contains a large percentage of asphalt. Then, Mexico does not have

any facility for refining oil and most of the oil is carried by tanker to the refineries of the North Atlantic ports of Europe and U.S.A. About 2/3rd of the Mexican oil goes to U.S.A. for refining.

U.S.S.R.—The U.S.S.R. occupies the second position in the world oil production and oil is found in the following five areas:—

1. Southern oil region or the Caucasus area where Baku is the most important centre. 60% of the oil is obtained here.

2. Volga-Ural region which is called the second Baku and from where 40% of the total produce is received. This oil belt spreads from Ukhta on the North of the western slope of the Ural mountain to Startomask in the South. Ufa is the most important centre.

3. Central Asiatic Russia where oil production has been spreading very fast and at present 15% of the oil production comes from this area. This includes the region north of the Caspian Sea, Uzbekistan, Kazakistan and Turkoman Republic.

4. The Petchora region in the extreme north.

5. Sakhalin region in the far east.

At present, Volga-Ural region is the greatest producer and numerous oil refineries are being set up. Higher technical assistance and turbine drilling has been generally responsible for the vast increase in the Russian oil production. It is also estimated that Russia possesses the largest reserves of oil in the whole world but it has not so far been ascertained. Although, Russian oil production is fairly high, per capita production is still less than that of U.S.A.

A century ago Russia extracted about 16,000 tons of oil a year. And, now the same quantity of oil is processed daily by the Moscow oil refinery alone.

There has been a particularly big growth of oil extraction in the years of the past Seven-Year Plan. Oil output in these seven years was 18.5 million tons. In the period between 1959 and 1965, the Soviet Union extracted as much oil as was put out in the country in the preceding 94 years. Discovered in the seven-year period were about 400 new oil deposits. The number of industrial deposits of oil in these years increased two-fold. The prospecting of oil is being done in the European part of the U.S.S.R., in Central Asia and Siberia. 1500 million tons of oil is the new Five Year plan target.

This year 264 million tons of oil will be extracted and that is 21 million tons more than was extracted last year. The successful fulfilment of the plan for the first quarter of the year is a good sign and, one might say, is a voucher of the fulfilment of the plan of the first year of the five-year period.

The Soviet Union has extensive potential oil resources. At present 37 oil bearing basins have been found in the country. The total area of the land offering prospects for oil extraction is 12 million sq. km., and that is almost a half of the country's territory. These are situated in the European part of the U.S.S.R., in Soviet Central Asia, in Siberia and in the Far East. The new oil deposits have been discovered and prospected within the Volga-Urals oil and gas bearing province, including the Perm Region, the Bashkirian and the Tatar Autonomous Soviet Socialist Republic, the Kuibyshev and Orenburg Regions. The Volga-Urals province is the leading oil extraction area of the country.

New highly productive oil deposits have been discovered and commissioned in Northern Caucasus. A whole group of rich oil deposits has been found and is already being processed in the Dnieper-Donetz depression which is in the eastern part of the Ukraine. In Azerbaijan some new deposits have been discovered in the Caspian Sea and on the ground area in the Prikurniskaya lowland. The famous Neftyanoye Kamni off-shore deposits are being developed as formerly. By now the off-shore oil fields functioning on mighty trestle bridges supply more than a half of all the oil extracted in the republic. Very important is the discovery and the development of an oil deposit in Kotur Tepe, which is in a desert in Turkmenia. At present, Turkmen and Azerbaijan oilmen are moving to meet each other as they develop the off-shore oil deposits in the difficult conditions in the depth of the Caspian Sea.

Rumania—Rumania has a very important position in the world oil production and the oil wells are found in the southern valley of the Carpathian mountains. The oil bearing region extends from Susive in the north to the Dam-Veritza valley in the south. The important areas of oil production are :—

Dam Veritza valley.....54%

Parhova44%

Bazau and Bakau 2%

Foreign oil interests and the encouraging policy of the State has been generally responsible for the development of oil in Rumania. 70% to 80% of the total production is exported and as such oil industry occupies a very great importance in the national economy.

Burma—90% of the oil of Burma comes from the Irrawaddy valley. The three principal centres are :—

1. Yenang Yaung. 2. Singu 3. Yenangyet,

The crude oil is carried by pipelines to the tanks made specially on the river bank. From there it is pumped into specially constructed floating tanks which carry it to Rangoon where

most of the oil refining is done. Petroleum is also taken out near Akyab on the Arakan coast.

India & Pakistan—95% of India's oil comes from Assam where oil wells are found in the Digboi and Naharkatiya region, in the upper Brahmaputra valley. Oil has also been struck at Ankleshwar near the Gulf of Cambay in western India and exploration of oil is going on in Sunderbans, in the Kangra valley and in the Jaisalmer area of Rajasthan desert. Pakistan has some oil wells in the Attock region of Western Punjab and Baluchistan but the production is not very much.

Indonesia has a very important position in oil production and the production is gradually going up. Northern Borneo, Sumatra and Java are rich in oil. 4/5th of the petroleum produced in the far eastern Asia comes from these islands. Besides this, Indonesian deposits have a strategic importance because all other nearby areas are deficient in oil. Dutch and American companies are handling the work of oil drilling and working.

Japan is the only other country of Asia in the Far East which has some oil but its annual production is less than the daily production of the U.S.A. The oil bearing belt of Japan extends along the sea from Hokaido in the north to North Honshu. Akita and Nigata are the most important oil bearing areas situated in the western part of North Honshu. 95% of the Japanese oil production comes from these two areas. *China* is deficient in oil but it has been trying to produce some shale oil recently.

West Asia—West Asia includes Turkey, Cyprus, Syria, Lebanon, Israel, Jordan, Iraq, Iran, Saudi Arabia, Yemen, Aden, Federation of South Arabia, Muscat and Oman, Trucial islands, Abu Dhabi, Qatar, Bahrain islands, Neutral zones between Iraq and Saudi Arabia and Saudi Arabia and Kuwait and several other tiny islands.

Undoubtedly the oil is the key mineral of West Asia. Amongst the countries in West Asia, Kuwait, Iran, Saudi Arabia, Iraq, Bahrein islands, Qatar, Trucial islands, Neutral zone between Kuwait and Saudi Arabia and a tiny islands of Abu Dhabi (a British Protectorate) in the Persian Gulf hold the key position in petroleum supply.

They contribute nearly one-third of the total world production and control 50% of the world trade in petroleum today. Their economy, apart from agriculture (primarily cotton) is mainly based on earnings from the production and export of oil. They derive a fabulous income from oil. A tiny Kuwait has an average income of Rs. 5,000 million from the royalty on crude petroleum alone, which is shared by a population hardly exceeding 3,22,000.

Israel produces a very small quantity of oil. The total domestic requirements are mainly 3 million tonnes per annum.

She meets about 90% of her requirements from Iran. Prior to the war of Suez Canal in 1956, Iraq was the main supplier, but Iraq stopped the supply of crude to Israel and cut off the pipe line. Israel, however, is making a hectic search for oil and has discovered new fields in Mir Am-Helatz area and is labouring hard for self-sufficiency.

Syrian production is negligible ; Jordan and Lebanon have practically no oil. Syria, Lebanon and Jordan, however, form a linchpin in a system of pipe lines laid for transporting crude to the Mediterranean ports from Iraq and Saudi Arabia. There is also no production of oil in the Neutral zone between Iraq and Saudi Arabia. Yemen, Muscat and Oman, Federation of Saudi Arabia and Aden. But Aden has a refinery under British control, and terminals of crude oil pipe lines which supply petroleum to tankers, bunkers and export refined products to several countries. Arabian Oil Co., a Japanese company, holds concession in Neutral zone between Kuwait and Saudi Arabia, and exports crude mainly to her own country.

Kuwait is the largest producer of petroleum in West Asia and ranks fourth in the world followed by Saudi Arabia, Iran and Iraq ; the first, second and third being the U.S., the U.S.S.R. and Venezuela. Kuwait receives an annul royalty (from petroleum, accounting for 95% of her total revenue. The entire economy of this country thus depends upon oil. A total of nearly 1/5th of the crude production from Kuwait used to be exported to the U.K. prior to the recent Israel and U.A.R. war. Other countries in Europe importing crude from Kuwait are Belgium, Denmark, France, West Germany, the Netherlands, Switzerland and also the U.S.A. and a number of countries in the Far East and Australia.

Saudi Arabia is the second largest producer in West Asia and fifth in the world. The earning from oil is 80% of her total revenue. There are more than 10 producing fields of which Ghawar, Abquaiq, Quisumah, Safaniya Khurais and Khursaniya are important. Arabian American Oil Co., (Amarco) is the main producer of oil in Saudi Arabia. Pipe lines have been laid to transport crude from Amarco's Quaisumah field to loading terminal at Sidon in the Lebanon. Tanura is the main terminal in the Gulf of Arabia. Arabian Oil Co., (Japan) has also entered into the oil fields of this country in 1963. Crude oil is exported to the U.S., Canada, Australia and to a number of countries in Europe, Africa and Asia. The prospects of finding other minerals in Saudi Arabia are very bright as a result of recent geological work completed in the entire area. Iran which was not involved in Israel-Arab conflict, is one of the richest producers and exporters of crude and refined oil in the world.

Iran is the third major oil producing area in west Asia. Here oil is obtained from two major areas :

(1) One oil field is situated at Masjid-e-Suleman which is about 30 miles south of Shustrar. This covers about 50 sq. miles area.

(2) Second oil field is found at Haftkel which is about 40 miles further down. Its area is 40 sq. miles.

There is a consortium of several European companies of international repute working in Iran. National Iranian Oil Company and Iran Pan American Oil Co. hold the major concessions in it. With an average annual production of 81 million tons (approximately 583.2 million barrels), Iran is well laid with the pipe lines for the transport of crude. Export of oil and gas through pipe line to the neighbouring districts of U.S.S.R. is also under consideration.

Agha Jari Kharg island, Darius and Alborz oil fields are important producing centres. Rich reservoirs of oil are found in the inland and offshore areas of Iran.

Iraq comes next in importance. The chief oil bearing area is Baba Gagur in Kirkuk which is situated about 150 miles north of Baghdad. A British company works the Kirkuk oil fields and oil is carried by pipelines to the Mediterranean ports of Haifa and Tripoli. It exports oil to several countries throughout the world and the revenue from the oil is not less than 85% of its total earnings.

Turkey has very small petroleum resources. *Egypt (U.A.R.)* has oil on the western coast of Red Sea and even though its production has been increasing day after day, the current production of oil is just sufficient for normal internal consumption.

A new oil field has been discovered in extension to Balayim Marine field on the Gulf of Suez in Sinai area. More new fields have been located in the western part of U.A.R., stretching from El-Alamin to the Libyan border.

Africa—Libya has the largest reserves of petroleum in Africa and has become one of the two major oil suppliers. Now it ranks among the first eight oil producing countries in the world including Russia. Hofra, Ora and Beda are the main producing centres. The crude is transported through pipe lines to Ras Lanuf port for export.

The Central and North Sahara and North Algeria are the potential sources of petroleum. *Algeria* is the second largest producer of oil in the continent, with production reaching 0.8 million barrels a day. For the transport of oil, a pipe line from the Central Sahara to the Mediterranean has been laid.

A new pipe line from Hassi-Messaoud to Arzew, a terminal on the mediterranean, has been laid for the transport of the North Sahara crude. The production is well over 28 million tonnes a year. The world's first commercial methane liquefaction plant is

located in this country which was opened in August, 1964, and went into full production in March, 1966. Standard Oil Co. (N.J.) has signed a 20 years contract for the sale of 235 million Cf/d of Libyan liquefied natural gas to S.N.A.M., an affiliate of E.N.I. in Italy. The oil interests in Algeria are principally held by the Algerian and French.

International Trade—World consumption of oil has increased tremendously during the last few years. As a result of this greater demand, many new refineries have been set up and there has been a considerable increase in the oil trade. Roughly, we can say that following is a picture of the *world utilisation* of petroleum products :—

(Million metric tons)			
1. Household	100	5. Ocean Transport	50
2. Air Transport	20	6. Electric power and Gas	20
3. Road Transport	180	7. Industry	110
4. Railway and Inland Waterways	40		

Table XI : 2—The main oil-consuming Countries

	% of the world total
U.S.A.	35
Soviet Union, East Europe, China	15
Japan	6
West Germany	5
Britain	5
Canada	4
France	4
Italy	4

The chief exporters of oil are the Middle East, Venezuela, U.S.A., Rumania and Colombia. U.S.A. is the only country which exports whatever is left after a high consumption at home. The other exporting countries listed above export almost the whole of their production. The place of oil in the export trade of some of these countries will be clear from the figures given below :—

Venezuela	90%	Rumania	52%
Iran	73%	U.S.A.	10%

In respect of West Asia it would not be an exaggeration to say that the economic life of the West Asia countries depends on the export of oil. Petroleum accounts for 1/10th of the total International trade. The eight countries in the West

Asia and Africa have almost their entire international trade in oil, which forms over 90% of Venezuela's exports. 40% of the foreign trade of Indonesia consists of oil. As a matter of fact 70% of the traffic passing through Suez Canal is petroleum.

Table XI : 3—Trade in mineral Oil (in percentage)

<i>Exporters</i>		<i>Importers</i>	
Venezuela	37%	Netherlands	21%
Kuwait	21%	U.K.	13%
Saudi Arabia	16%	U.S.A.	16%
Iran	14%	France	12%
		Italy	7%
		Canada	5%

The most important importers of oil in the world are Great Britain, France, U.S.A., Japan, Germany and Italy. Great Britain imports crude oil and refines it in its own refineries. After meeting the consumption at home it exports whatever is left as a surplus.

Hydro-electricity And Atomic Energy

1. WATER POWER

Water has been found to be a very great source of energy. The falling water is an important source of generating electricity and working machinery. The utilization of water for generation of electric power dates back to the last 50 years but slowly and steadily its importance and utility is being felt more and more. As against coal and oil, water is inexhaustible and then one saves about 4 tons of coal for generating one H.P. of electricity by water. On the basis of water power, which is also known as white coal, it has been possible to speed up industrialization in those countries of the world which lack both coal and oil. Switzerland, Finland, Canada and Sweden owe all their industrial development to hydro-electricity. 92% of all the power produced in Sweden comes from water falls. Italy, Spain, France and Germany are examples of those countries which use both coal and water power.

But occurrence of water in order to be useful for the generation of electricity depends upon a large number of circumstances. Water power depends very much on geographical factors like climate and relief. The most important factors affecting water power is some form of natural water storage. Then, the water must fall from a certain height so that the turbine placed underneath may be able to move. This naturally means that if the land is high like Norway, it may be rich in power from water falls. If the natural waterfall is not there, an artificial fall has to be made and only then water power can be produced.

Conditions Favourable for Development of Hydro-electricity

1. The rainfall must be quite heavy and sufficiently well-distributed over the year. Seasonal distribution of rainfall which gives three months flood and six months' drought, as is the case with monsoon and Mediterranean lands, is not suitable for hydro-electric development and in order to ensure a regular supply of water throughout the year, some kind of water storage becomes essential.

2. Natural lakes, forests, snow fields and glaciers are wonderful as natural water storage. These have the great advantage

of regulating the flow of water. Snow fields and glaciers are all the much better because they release water in time of summer drought while hold it tight in the period of winter. Where such natural facilities do not exist, the flow of the stream has to be dammed so as to pile up the water in reservoir.

3. The presence of high mountains or some form of slope is necessary so that water flow is maintained and it also falls.

4. The water in the rivers must be perennial because shortage of water as well as excess of water, both are injurious to water power development.

5. The winter must not be so cold that the rivers might freeze and the power generating plants might become idle.

6. There must be lakes in the course of the river so that rivers might deposit their sediment and only clear water reaches the generating plant. Water mixed with sediment is harmful to power generating plant.

7. The plant and machinery required for generating hydro-electricity are quite heavy and bulky. Therefore, for erecting power house, etc. the site of power should be easily accessible.

8. Transmission of electricity is done through wires and it has been normally seen that beyond 300 miles, transmission wires lose their power of transmission. Therefore, the site of hydro-electric power development must be sufficiently close to a densely populated industrial area.

Loss of power in electrical transmission are as follows :

<i>Miles</i>	<i>Per cent</i>
100	8
200	10
300	13
400	17
500	21

It is expensive to build power houses, erect the plant and construct the dam. In order to meet and justify this initial cost, hydro-electric power development is possible only in those regions, where coal and oil are not easily available on cheap rates. In Norway, Switzerland, Finland, Canada, Sweden and Italy, hydro-electric power development has taken place only because coal and oil are not available. As against this, Scotland has not been able to develop any hydro-electric power even though all the natural facilities for this purpose exist there because coal is widely and cheaply available.

10. Hydro-electric power development is quick in those regions, where water, after it has been utilized for generation of

electricity, can be used for purposes of irrigation. This yields an extra income to reduce charges on capital.

Reasons of Hydro-electric Power Development

In recent years, there has been great progress in the development of hydro-electricity in the world. This has been due to the following factors :—

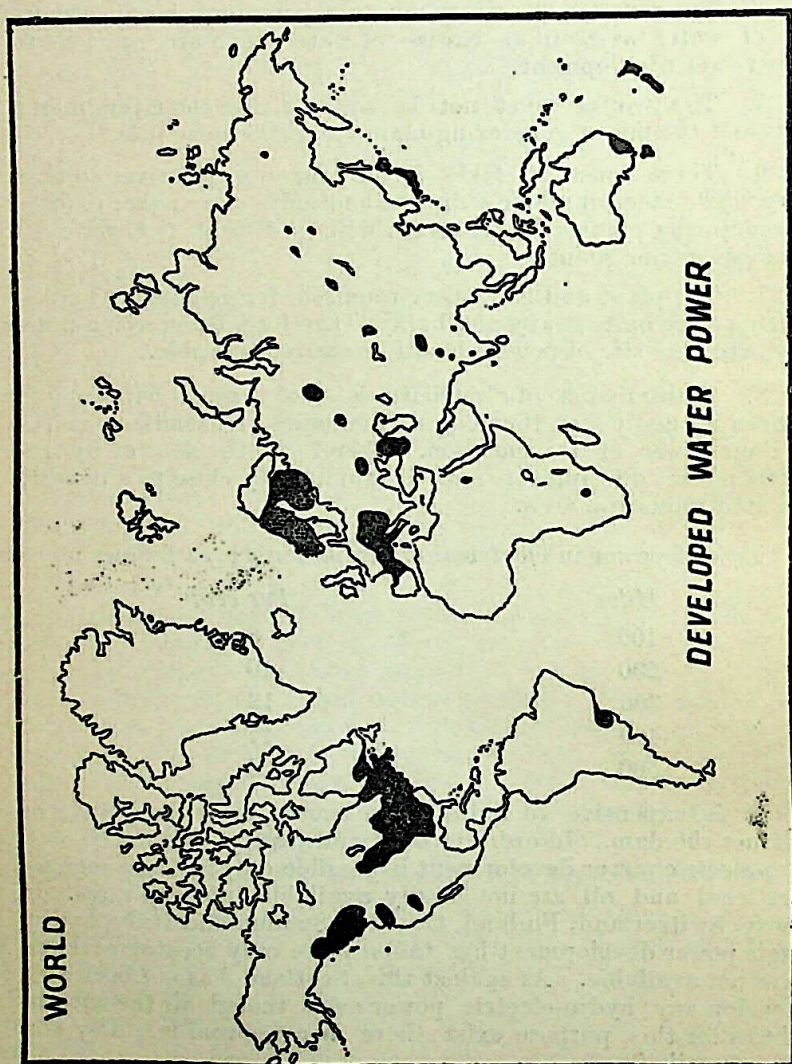


Fig. 34

1. Aluminium, synthetic fibres and newsprint manufactures require specially cheap form of electric power.

2. Many areas have developed industries even though coal is found far away.

3. Coal and oil production in the world is gradually depleting the reserves and the advanced nations of the world are very anxious to find out some alternative means of energy.

4. In many agricultural regions of the world, the need for irrigation has led to the construction of dams across the rivers and they have also been utilized for generating hydro-electricity.

Potential and Development—*Africa, Asia and South America* have all the natural facilities which favour the development of hydro-electricity but because of low demand and poverty of people, there has not been much development. The highest potential of hydel-power lies in the equatorial regions of Africa. As a matter of fact the discrepancy between potential water-power and developed water-power is highly striking. At present, only about 20% of the world's potential has been developed and the principal countries where power development has taken place are those parts of North America and Europe which were, once upon a time, under the great ice-sheet. *India* has developed only 5% of the potential power. *Japan* is another important Asian country which has extensive water-power resources and they have been widely developed also. 55% of the hydro-electricity produced is consumed in cottage industries. *China* is very poor in hydro-electric power development. A lot of development has taken place in southern mountains of *Asiatic Russia* but even then the total amount of hydro-electric power produced in Asia is less than that produced in Norway and Italy taken together. Recently, great efforts have been made to increase hydro-electric power generation in several countries of the world and developed power in South Africa, Argentina, and India has become double of what it used to be before the war. Algeria, Morocco, Brazil, Chile, Japan, Malaya and Indo-China have increased their hydro-electric power generation six times over the pre-war level.

Table XII : 1—Development of Hydro-electricity

(Lakh Kilowatts)

Country	Capacity	Country	Capacity
Canada	110	Great Britain	10
Norway	40	France	80
U.S.S.R.	300	India	10
U.S.A.	250	Italy	90
Sweden	50	Japan	80
Switzerland	40		

Total for the world 1300.

Germany, Australia, Spain and U.S.S.R. are other countries which generate hydro-electricity. Africa has 40% of the world's

petential. The position of developed water power in relation to potential water power will be clear from the following figures :—

<i>Country</i>	<i>Percentage</i>	<i>Country</i>	<i>Percentage</i>
Switzerland	68	Canada	40
Germany	56	U.S.S.R.	36
Norway	60	Sweden	28
France	45	U.S.A.	25
India	5		

Main Areas of Water Power Development—In water-power the world has a total capacity, at mean flow, of about 2300 million kilowatts, Asia accounts for the largest share of 28.1% closely followed by Africa (27.8%) and South America (20.3%). In this area comprising most of the developing countries, however, the actual production of hydel power is less than 10% of the potential. On the other hand, though Europe has only 7.2% of the total and North America only 10.7% of the total, they have exploited about 50% of this potential.

95% of the developed water power is centered in two areas of the world :—

1. Eastern part of North America, and
2. Western part of Central Europe.

These two belts include eastern part of U.S.A. and Canada and Norway, Sweden, Switzerland, Italy and France besides U.S.S.R. in Europe.

American Belt—The U.S.A. and Canada are the largest producers of hydro-electricity in the world. The Niagara falls are the chief sources of hydro-electric power and water power is produced from these falls at one place on the side of the U.S. and at three places on the side of Canada. Most of this energy is consumed in the factories, homes and transport facilities of nearby areas. California, New England States and Rocky mountain States possess natural facilities for water-power development in the U.S.A. The Eastern and South-Western parts of Canada are specially favoured by nature in respect of hydro-electric power generation. The following are the foremost areas of water-power generation in the U.S.A. and Canada.

(a) *South-Western Canada and North-Western U.S.A.*, where 1/3rd of the potential exists.

(b) *Eastern Canada and North-Eastern U.S.A.*, where greatest amount of Hydro-electric power has been developed.

(c) *South-western U.S.A.*, where the world famous Colorado valley exists and which produces about 1700 lakh kilowatt electricity.

(d) *South-Western U.S.A.*, where hydro-electric development is less marked but most of the projects carry on irrigation side by side with water-power development. The world famous (Tennessee Valley Authority) T.V.A. is here.

The *Niagara falls* are the most important because the power site is situated in a thickly populated region, where we find great demand for electrical energy. About $\frac{3}{4}$ th of the power generated is used in the neighbourhood and there is a plan to establish newer plants for developing more power. At present, there are seven electric power plants, five on the Canadian side and two on the U.S. side. Canada produces 60% of the total power. The wood pulp industry of Canada is entirely dependent on water power and the industrialization of Canada owes a good deal to the development of hydro-electricity.

In the *New England States*, all the towns are situated on the fall line. Hundreds of smaller falls combined have a greater power than even Niagara falls and many of them are already in use. It was this glacial water-power which started manufacturing in North-Eastern United States. Closeby, there is extensive but yet almost unused hydel-power with many streams flowing from the lakes and swamps of the large glaciated plateau between the St. Lawrence river system, the Atlantic Ocean and the Hudson Bay. The province of *Quebec* is the most important in this respect.

The *Tennessee Valley Authority* is an example of the development of the river water for navigation, irrigation and power generation. In the south-eastern part of the United States, this river along with its tributaries, flows over an area of about 46 thousand acres. It has been dammed at 12 places and the chain of lakes thus created control floods and provide hydro-electricity. About 200 million Kilowatt of hydro-electricity is produced.

The *Columbia river basin and the Hoover dam* are the two most important hydro-electric plants in the Rocky mountain states of the U.S.A. Grand Coulee dam and the Bannville dams are the two most important units in the Columbia basin. Hoover dam project is in the Colorado valley. All these produce power as well as release water for irrigation. In California, a long tunnel has been built from one branch of the San Jaquin river to another and here four power plants produce about 14,07,000 H.P.

The navigable *Mississippi river* has been dammed at Keokuk in the State of Iowa, where 1,75,000 H.P. electricity is generated. This along with the Missouri Valley Authority, aims at irrigation, navigation, flood control and 2.5 million kilowatt of hydel power generation.

In the U.S.A., most of the hydro-electricity produced is consumed in industries, domestic lighting and in running railways and tramways. The aluminium factories and wheat flour mills all consume water power. 25% of the total energy developed is hydro-electricity. The saw mill and wood-pulp manufacturing industry

of Canada is entirely dependant on water-power. Electro-metallurgical and electro-chemical industries are also run by means of hydro-electricity.

Western and Central European Belt—Due to the following reasons, very great development of hydro-electric power has taken place in Europe :—

1. There has been a tremendous demand for industrial power due to rapid industrialization.
2. The sites where water-power can be developed are generally located near densely populated industrial towns.
3. Some of the countries of Europe are so poor in coal and oil that for a very long time there had been going on a search for alternative power.

Italy is one of the most prominent countries of Europe which has developed water-power for her economic progress. The slopes of the Alps mountains in Northern Italy are the sites of very good natural falls. The Alps receive heavy rainfall and their snow fields are very good for maintaining a regular flow in the streams. Due to lack of oil and coal, Italy runs all its factories and means of transport with the help of hydro-electricity. The Alps region to the north of Po valley is an extensive source of water-power and 65% of energy is produced there. *Switzerland* is also deficient in oil and coal and there all the industries and railways are run by hydro-electric power. 71% of the total energy generated comes from water power. The Alps, Pyrenees and Cevennes ranges of *France* possess vast potentialities for hydel power development. The south of France specially requires hydro-electric power. The silk industry of France is the special beneficiary. The iron and steel industry which has been developed to its utmost because of shortage of coal will also be developed if water-power is fully utilized in *France*. *Norway and Sweden* have rivers that fall from the mountains and are very great source of water power. Lakes and snow-fields make these rivers full of water all the year round and the result is that saw mills, paper and match factories in Norway are all worked by hydro-electric power. *Porjus* in Sweden is the great centre for the generation of hydro-electricity and the total power generated is utilized in running the railways and industries, the most important of which are paper and sawing. South and south-west of *Germany* has got some centres where hydro-electric power is developed but the possibilities for hydro-electric power development are very much limited.

In the European part of the U.S.S.R., hydro-electric development has taken place at a very fast rate and according to certain estimates, U.S.S.R. now ranks first in the world as far as water power resources are concerned. The European part of U.S.S.R. has got only 1/6th of the total potential, 5/6th being in the Asiatic part. In the European part of Soviet Union, Dnieper, Volga,

Dvina, Don are the chief rivers whose water has been utilized for the generation of hydro-electricity. The Caucasus region is also rich in hydro-electric power development. More than 50% of the total power resources developed in European Russia are found in the Caucasus regions. Dnepriepetrovsk, Kakhovaa, Kuvveshav and Stalingrad are important centres for hydro-electric power. The Asiatic part of Russia is also making fast progress in the development of hydro-electricity and numerous plants have been set up in Russian Turkistan, Manchuria and Lake Baikal regions of Siberia.

Others—In Asia, India has made a very great development in hydel power development and still vast potentialities exist. The potential water power resources of India amount to 22 million H.P and 80% of the developed resources of India lie in the Western ghats in Maharashtra, Madras, Mysore, Kerala and the Punjab. At the present moment, numerous schemes for hydro-electric power development are being completed in the country and Bhakra-Nangal, Damodar Valley, Hirakud and Rihand Dam projects etc. are of great importance. The Koyna project in the Maharashtra and Muchkund project in Andhra Pradesh and Orissa are of very great significance and they will bring a great change in the shape of developed power when they are completed.

2. NUCLEAR OR ATOMIC POWER

In all power producing systems, it is the generator which produces electricity. And to produce electricity in large quantities, the huge turbines must move continually to turn the rotors in the generators. The problem is to find a way of turning the turbines. In hydro-electric stations, the force of water does the job. In thermal power stations the turbines are moved by steam pressure. Coal or oil is burnt; the heat is used to produce steam. A nuclear power plant works on the same principle, except that here the source of heat is not coal or oil, but the nuclear reactor.

How does the reactor serve as a source of heat? This is where we talk of fission. It is because of fission that heat is produced in the reactor. Fission occurs when a neutron enters the nucleus of an atom and breaks it up into two or more parts which fly apart at great speeds. The kinetic energy of these is turned to heat speeds. Moreover, when fission occurs, not only energy, but two or three neutrons too are released. These neutrons which are very fast moving can be made to fission other nuclei, thus enabling a chain reaction to take place. When a large number of fissions occur, an enormous amount of heat is liberated.

The nuclear power plants are free from the inconveniences attending on disel, thermal or waterforce and siting is normally governed by availability of large quantities of cooling water and requirements from the point of view of nuclear hazards. They, therefore, can be located as near the load centres as the above requirements will permit.

Historical Development—2nd December 1942 and the time 3.25 P.M. have become historic because on that date and time, in a room beneath the West Stands of Stagg Field at the University of Chicago, Entica Fermi triggered off the first ever nuclear chain reaction. This was, indeed, the birthday of the Atomic Age.

Two and a half years later, after the successful dress rehearsal at Alamogorodo, nuclear power reached the market at Nagasaki and Hiroshima. Mankind has been expiating since then.

Ever since the slogan "Atoms for Peace" became men's enlightened motto in 1955, nuclear energy has made its mark in almost every field of human activity—industry, agriculture, and medicine. And its greatest impact has been in the field of power generation, producing electricity with the help of nuclear reactors.

By the end of this year, there will be 479 reactors operating in the world. Of these 105 are power reactors generating nearly 20,000 megawatts of electricity in 15 countries. The other 374 are for research, testing and training purposes in 48 countries. By 1975, the number of power reactors will rise to 233 in 21 countries, generating nearly 130,000 megawatts of electricity.

The fast breeder reactors are expected to play an important role in the field of power generation the world over in the 1980s. It is the precise objective of the Government of India to ensure that during the 1970s, India installs a family of thermal reactors which, while providing power on an economically competitive basis, produce the inventory of plutonium which

will be necessary for India's on going programme in Phase II of its strategic plan.

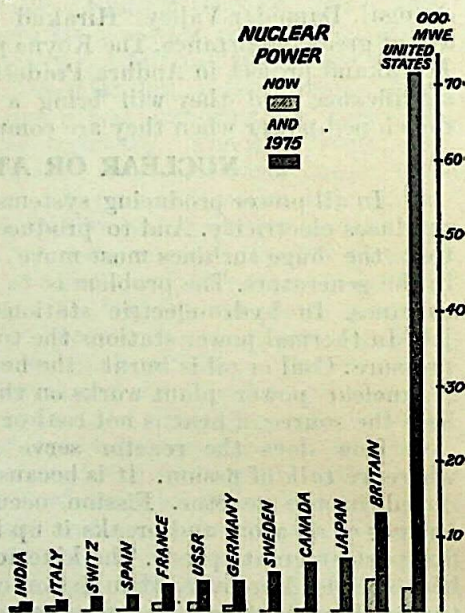


Fig. 35.

Main Regions of Development—The growth of nuclear power, which dates from the mid-1950s and only took off in the second half of the 1960s, is still confined mainly to Britain and the United States, with Britain owning more nuclear generating plants than any other country. But by the end of this year the U.S.

will for the first time have passed the British total, with 24 power stations operating and producing a total of 7,141 MW to Britain's 5,353 MW. But these two countries will still be way ahead of the rest of the world. The Soviet Union, for all that it was the first country to start regularly generating nuclear power in 1954 from a small station just outside Moscow, ranks a poor third now, only a nose ahead of France. By next year France will have more installed nuclear capacity than the Russians. When it comes to the mid-1970s, the US will, as the chart shows, have more than six times the installed nuclear capacity of any other country while Japan, Canada and Sweden will, in that order, rank third, fourth and fifth behind Britain, although they figure at this present moment only as traces at the bottom of the chart.

The International Atomic Energy Agency has recently made a compilation of the ranking of countries in 1969, 1970 and 1974 in relation to their estimated installed nuclear power capacity. Table 2 brings out how other countries are developing atomic energy.

Table XII : 2—On the Basis of Forecast of Estimated Installed Nuclear Power Capacity (MW_r)—Position of Countries in the Year—

1969	1970	1974
1. U.S.A.	U.S.A.	U.S.A.
2. U.K.	U.K.	U.K.
3. U.S.S.R.	France	Japan
4. France	U.S.S.R.	Canada
5. F.D.R.	Canada	Sweden
6. Italy	Japan	F.D.R.
7. Spain	F.D.R.	U.S.S.R.
8. India	Italy	France
9. Japan	Spain	Spain
10. Switzerland	Sweden	Switzerland
11. Canada	India	Belgium
12. Sweden	Switzerland	Italy
13. Czech oslovakia	Czecho slovakia	India
14. Netherland	Pakistan	Bulgaria
15. Belgium	Netherlands	Finland

CHAPTER XIII

Minerals

1. IRON ORE

In the present mechanized world, the modern civilization depends so much on iron that an abundance of this metal is generally considered an essential part of the nation's wealth. Without the exploitation and use of iron and steel, no nation can develop great manufactures and this most useful of all the metals is also found most extensively. Although iron ore is found almost at every place, it is not mined so universally because either it is not economical to work it out or the metal content is very low.

Favourable factors—The value of iron ore deposits depends upon the following factors :—

1. Richness in iron.
2. Ease of mining.
3. The nature of other competing ores.
4. The nature of the impurities and the specific use to which it has to be put.

Therefore, even though 5% of the upper crust of this earth is made up of iron and it is estimated that in every one ton of earth's crust, there is 1 cwt. of iron ore, still iron ore's working is limited to certain areas only where it is profitable to take out iron ore.

1. When iron ore is taken out of earth, it is in an impure state. The amount of metal content present in the ore varies and accordingly these are several varieties of iron ore. The most important are :—

(a) *Hematite* ore which has got 55 to 70% of metal in it. Its colour is red or slatish.

(b) *Magnetite* ore which has the metal content of about 72% and whose colour is black.

(c) *Siderite* which has a mixture of iron with carbon.

(d) *Limonite* which has a mixture of oxygen, hydrogen and iron ore. In the last two categories, the quantity of metal content is about 30 to 50%.

2. The iron mines, in order to be usefully worked, must be situated near industrial centres or they must be accessible by means of transport.

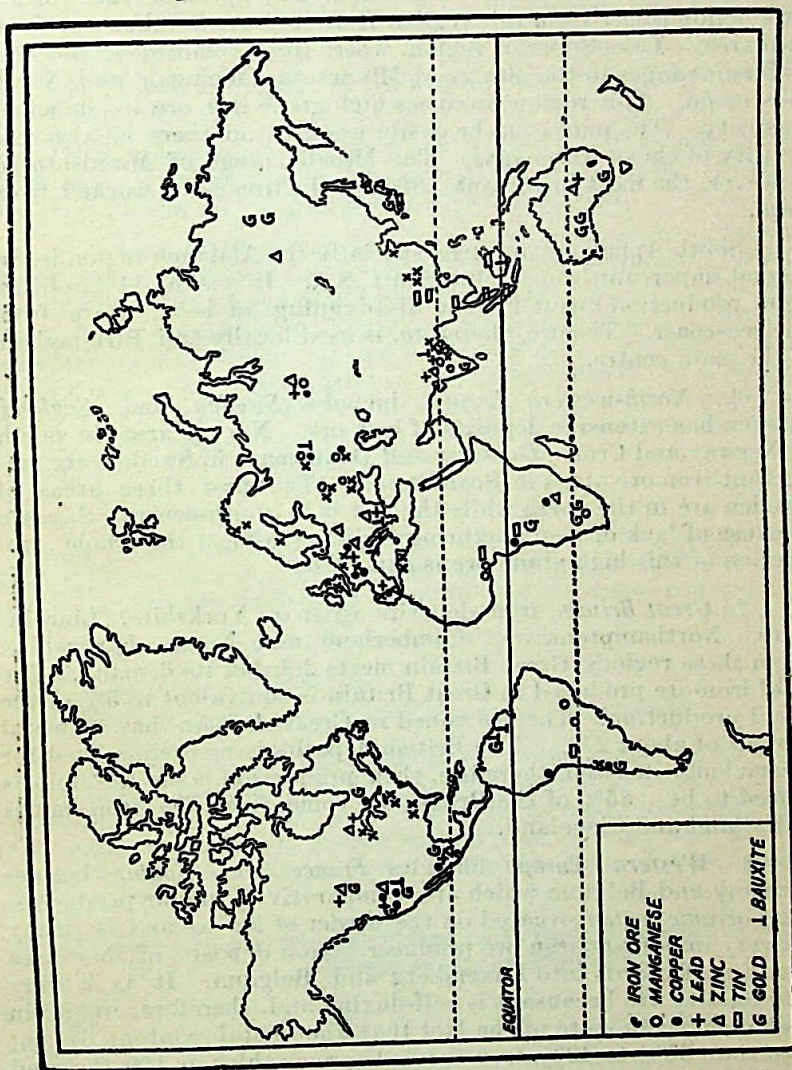


Fig. 36. Important Minerals found in the world.

3. In order that iron ore may be melted, purified and used for different purposes, it is necessary that coal bearing regions must also be nearby.

4. Iron mining is easier in those regions where land has been cut up by the streams and it is not difficult to reach below.

Iron Bearing Regions—The most important iron-bearing

regions in the world are four in number :—

1. *The North Central Part of the U.S.A.*—This is the largest producer of iron ore in the whole world and 1/4th of the world's production comes from this region. Here iron ore is taken out from two areas—Lake Superior region, where iron is mined from eight different ranges in the States of Minnesota, Michigan and North Wisconsin. This region produces high grade iron ore in sufficient quantity. The mines can be easily worked and there is also the facility of cheap waterways. The Mesabi range of Minnesota is, however, the most important. 86% of the iron ore is worked from here.

South Appalachian range, specially the Alabama region is the second important iron producer in U.S.A. It yields 14% of the total production but it has the disadvantage of being away from the sea-coast. The ore, therefore, is used locally and Birmingham is the main centre.

2. *North-western Europe.* includes Sweden and England. Sweden has extensive deposits of iron ore. Narvik area in north of Norway and Cruna, Gussiver and Donnemara in Sweden are important iron ore areas in Scandinavia. The first three areas of Sweden are in the north while the last is in south-central Sweden. Because of lack of manufacturing facilities, almost the whole production of this high grade ore is exported.

In *Great Britain*, iron deposits exist in Yorkshire, Lincolnshire, Northamptonshire, Cumberland and North Lancashire. From these regions, Great Britain meets 2/3rd of its demand. The total iron-ore produced in Great Britain is equivalent to 5% of the world production. The ore mined in Great Britain has a metal content of about 27%. The British deposits have been worked for a very long time and, therefore, their production is not as high as it used to be. 85% of the British ore comes from the iron mines of Midland and Cleveland.

3. *Western Europe* includes France and Spain, besides Germany and Belgium which are comparatively minor producers. The *Lorraine region* situated on the border of France and Germany is a very important iron ore producer. Iron deposits of this area extend northwards into Luxemburg and Belgium. It is a very good quality ore because it is self-fluxing and, therefore, it is in great demand in spite of the fact that the metal content is not more than 35% to 42%, iron ore beds are as thick as 120 ft. and are as deep as 750 ft. Tongway, Briesy and Nancy are the chief centres where ores are worked.

Spain occupies a very significant position because of its high quality iron deposits. The iron ore deposits are the mainstay of the European steel industry. The iron fields are found all along the coast land of the peninsula. Because they are situated at a height of more than 1,500 ft. iron ore can be easily brought to the

seacoast but because of the mountainous structure, it is costlier to transport. These ores contain 50 to 60% of the metal and they can be easily worked because the deposits are very near the surface. The two most important areas known for their iron deposits in Spain are :—

(1) Cantabrian region in the north which yield $\frac{2}{3}$ of the total production and,

(2) Southern region situated east of Gibraltar which yields $\frac{1}{4}$ of the total production. Because of the lack of steel making industry, almost all the iron mined here is exported.

4. U.S.S.R.—U.S.S.R. has got extensive iron ore deposits and recently it has become the greatest iron-ore producing country in the world. Seven new iron fields have been found out and at present there are about 13 iron-ore producing regions. Nine of these are very important. Upto a few years back, the known iron ore deposits were said to exist in the Donetz basin and Tula but now it has been found out that there are other important areas also. The following are some of the most important iron-ore bearing regions of the Soviet Union :—

(a) Kursk region.

(b) South Ural region, the chief centre being Magnitogorsk. This contributes 25% of the national out-put and the ore is of very a high quality possessing about 20% of the metal content.

(c) Kuzbuz region in Western Siberia.

(d) Murmansk Peninsula.

(e) South Ural region, the chief centre being Orsk.

(f) South Ukraine where the chief centre is Krivoirog. The region contributes 60% of the national output and the ore is of sufficiently good quality with about 68% metal content. The reserves are estimated to be 200 million tons. During the second world war, all these regions have become the seats of very important industries.

Table XIII : 1—Percentage Share of Different Countries in World Iron-ore Production

U.S.S.R.	32	U.S.A.	17
France	7.5	Canada	7
Sweden	5.7		

The principal iron ore reserves in China total 19,840 million tons, iron deposits near Hankow being one of the richest in the world.

Besides, there are iron fields in *French North Africa*, *Sierra Leone*, *Morocco* and *Union of South Africa*. In South America, *Brazil* contributes good type of iron-ore. The main centres are

Minaes Gerais and Itavira region, the latter being the most important iron ore reserve. Iron ore deposits are also found in India, China and Japan in Asia. In *India*, iron ore is mined in Orissa, Bihar and the Durg District of Madhya Pradesh. *Japan* does not produce sufficient iron ore for its industries. The annual production is only five lakh tons and there are only two important fields, one on eastern coast of Honshu and the other is in Hokkaido. In *China*, iron ore reserves are widely distributed in the lower Yangtze valley, the Shantung Peninsula and Manchuria. *Korea* and *Formosa* are also rich in iron ore. According to a general survey of the world iron deposits, the iron ore reserves of the world have been estimated as given below.

(Million metric tons)

U.S.A.	19,450	France	8,165
Germany	1,315	Sweden	2,203
U.S.S.R.	2,057	India	3,000
Great Britain	5,970	Brazil	7,000
China	19,840	New Foundland	4,000

International Trade—Although iron ore is mined in 45 countries of the world, 85% of the world production is obtained from U.S.A., Soviet Union, France, Great Britain and Germany; 90% of the world's known deposits exist in North America, France, Great Britain, Soviet Union, Union of South Africa, India and Brazil. The U.S.A. and Western Europe are the greatest consumers of iron ore because they have highly developed steel industry. Japan also consumes a lot of iron ore. Spain, Norway, Sweden are the great exporters of iron ore. Czechoslovakia, Poland, Rumania and Hungary have also developed their steel industry and they have also a great demand for iron ore.

As a matter of fact, iron ore is a heavy and bulky commodity of cheap value and it is found well distributed. Therefore, it does not very much enter into international commerce. The trade in iron ore is mostly local or regional. In North Western Europe, France is the largest exporter of iron ore and Belgium and Germany are the largest importers of this ore. Sweden and Spain also export almost all the ore that they produce, Venezuela and Chile in South America send their ore to U.S.A., while Brazil sends its ore to England. Japan gets its iron ore supply from India and China.

2. MANGANESE

Manganese is widely used in steel manufacture. 9/10th of the Manganese produced in the world is consumed in steel making and the rest goes into the chemical industry. The chief producers of Manganese in the world are Soviet Union, India, Ghana, Brazil and Egypt. The U.S.S.R. occupies the first position among the Manganese producers of the world and contributes 35% of the

world's production. The Chiatur and Nikopol areas near the Black Sea contribute 63% of the Russian Manganese. *India* produces about 6 lakh metric tons of manganese every year and the chief regions of production are Balaghat and Bhandara in Madhya Pradesh, Nagpur in Maharashtra and Nellore in Andhra Pradesh. *Brazil* has extensive deposits of manganese but at present it is being worked at Minas Gerais, Bahia, Urukum and Amapa. Brazilian manganese is of the best quality, *Ghana* and *Union of South Africa* are important producers of manganese in Africa.

Manganese is required in the Bessemer method of steel making and for every ton of steel, we require 14 lbs. of manganese. Some manganese is also consumed in the chemical industries while 95% of the demand is from metallurgical industries. Not a single major steel producer of the world, with the exception of Russia, has manganese deposits.

Most important manganese importing countries are those which have well developed steel industry like the U.S.A., France, Germany, Belgium, Great Britain and Norway. The Soviet Union, India, Ghana and Brazil are the chief exporters.

3. COPPER

Copper ranks second as far as industrial demand is concerned, the first being iron ore. Copper is in great demand in the electrical industry. The most important copper producing countries of the world are in North and South America and Africa. Asia and Western Europe have isolated small deposits here and there. The U.S.A. produces 30% of the world's copper. Arizona, Utah, Montana and Michigan States are important for copper production. *Chile* ranks second in copper production and the south eastern part of this country holds 1/3rd of the total copper reserves of the world. *Canada* is fourth in copper production. *North Rhodesia* and *Katanga* region of Congo are very important copper producing areas in Africa. These regions of Africa produce 5 lakh metric tons of copper. *Japan* in Asia and *Spain, Germany and Norway* in Europe are other important copper producing areas.

The U.S. accounts for about 40 per cent of the free world's refined copper production (its annual mine production was running around 1.2 million tons for three years, 1964-66, until it dropped to 830,000 tons in 1967). *Zambia*, normally ranks second only to the U.S., among the world producers excluding the socialist bloc. This position changed a little in 1966 and 1967, following a decline in its output. Zambia's average annual production is over 600,000 tons. It is the major non-Communist exporter in the world, selling 40 per cent of its production to European consumers under long-term contracts and the balance in public sale to other countries. The two Zambian producers who have announced a 20 percent cut in supplies account for the major part of the country's production. The cut is a sequel to acute fuel shortage and other

production problems faced by them, resulting in a slashing of the monthly output from 55,000 tons to 44,000 tons. The fuel problem of the Zambian copper producers is not a new one. They had been dependent on coal supplies from Rhodesia, but following the strains in the political relationship between the two countries, Zambia has had to rely on its own low-grade coal, which is not available in sufficient quantities and even causes serious damage to the furnaces because of its acid content. In fact, at one time last year, Zambian producers had to run down their output to 67 per cent of the normal.

Table XIII : 2—Production and Consumption of Refined Copper, (000 Metric Tons)

Area	1966		1967		1968	
	Produc- tion	Consump- tion	Produc- tion	Consump- tion	Produc- tion	Consump- tion
N. America	2,391	2,380	1,850	1,960	2,157	1,947
S. America	443	146	467	116	493	134
Europe	1,130	2,038	1,140	2,600	1,270	2,157
Africa	682	42	728	40	796	40
Asia	426	531	404	680	572	775
Australia	115	107	97	92	120	103
Soviet Bloc	1,169	1,180	1,200	1,220	1,256	1,250
Total	6,356	6,424	5,976	6,108	6,664	6,406

The greatest demand for copper is in the U.S.A., Germany and Great Britain. Belgian Congo is the greatest exporter. The copper consuming countries and the percentage of their demand will be clear from the following figures :—

U.S.A. 50% Western Europe 43% Japan 5%

Table XIII : 3—Per Capita Use of Copper Per Year (Primary Plus Scrap).

Area	lb.
N. America	... 28
S. America	... 1
W. Europe	... 17
Soviet Bloc	... 7.5
Australia	... 12
Africa	... 0.25
Britain	... 22
Germany	... 26
Japan	... 20
India	... 0.2

4. LEAD

Lead is normally found mixed with Zinc and Silver and it is used in different ways in various industries. It is used for making different types of pigments; glassware, typewriters, motor cars, aeroplanes, engines, printing presses, musical instruments and the bullets but the greatest defect in the use of this material is that after being once utilized, it cannot be recovered at all. The U.S.A. is the greatest producer of lead in the world. Missouri, Idaho, Oklahoma, Colorado, Nevada, Utah and New Mexico are important producers. *Mexico, Canada, Spain* and *Australia* are other important lead producers of the world. U.S.A. produces 30% of the world's lead but its consumption is 35% of the world's production. Therefore, it imports lead from the countries mentioned above. Sardinia, Spain and Yugoslavia are important lead producers in Europe.

5. TIN

Only one important ore of tin is cassiterite (tin oxide). This is obtained from veins or lodes frequently in association with wolfram and as "Stream tin" from alluvial deposits which have been weathered from veins. After concentration by washing and crushing, the concentrate is smelted when it yields 60 to 70% tin.

One most important use of tin is in the making of tin plate mainly for the rapidly growing canning industry. Tin plate is a sheet of mild steel covered with a very thin coating of tin which is applied by dipping the steel sheets into molten tin or by electrolysis. Large quantities of tin are also used for soldering purposes.

Table XIII : 4

1968

MINE PRODUCTION		CONSUMPTION	
	Tons		Tons
Congo (D.R.)	... 7,400	Canada	... 5,000
Bolivia	... 29,100	France	... 9,900
Indonesia	... 16,600	Italy	... 6,200
Malaya	... 75,100	Japan	... 22,200
Nigeria	... 9,600	U.K.	... 17,100
Thailand	... 23,600	U.S.	... 58,100
Other countries	... 21,100	W. Germany	... 11,600
		Other countries	... 39,900
World total	... 182,500	World total	... 170,000

Malaya produces over 2/3rd of the world's tin output. The metal is mined chiefly in the western valleys, the most important centre being the Kinta valley of Perak. It is nearly all alluvial,

being obtained from gravel in open workings and not mined under ground.

In *Indonesia* (15% of the world output) tin is mined in the islands of Banka, the chief producers, being Billiton and Singkep.

Tin is the only important economic product of *Bolivia* (13% of the world's output), providing about 90% of the total exports. The chief centres of production are in the departments Lapaz, Oruro and Potosi. Other producers are *Siam*, *China*, *Nigeria*, the *Belgian Congo* and *Australia*.

The U.S.A. consumes most tin, owing to the extensive use for tin plate in the great packing, canning and other industries of that country. Great Britain and the Straits Settlements smelt 75% of the world's ore of which 45% is from Commonwealth and *Indonesia*. Tin melting works were established in the U.S.A. during the war and this led to some falling off in the British output.

Table XIII : 5—Percentage share in the Export Trade of Tin

Malaysia	41	Indonesia	10
Bolivia	16	Nigeria	6
Thailand	11	Congo	4
		Others	12

The export trade is now being regulated by the Five Year International Tin Agreement entered into in 1966.

6. ZINC

Zinc is ordinarily found mixed with lead and copper and people use zinc for tinning iron-galvanizing. If zinc is covered over iron, the latter does not rust. It is also used in making pigments and in mixing with several kinds of metals. Zinc is also used in the making of brass. It is also mixed with other metals used in the manufacture of motor cars, machine tools and other industries. *U.S.A.* produces the largest quantity of zinc and 25% of the world's production comes from this country. *Oklahoma*, *New Jersey*, *Kansas* and *Utah* are the chief producers of this metal. Recently some zinc mines have been found in *Australia* which occupies the fourth position among the world producers of zinc. *Canada* comes next. There are also vast zinc deposits in *North Rhodesia*. *Australia*, *Canada*, *Mexico*, and the *U.S.A.* contribute 2/3rd of the total world's production.

16% of the world's supply comes from the *U.S.A.* and *U.S.S.R.*, about which exact production figures are not available, accounts for 12% of the World's total.

34% of the world zinc deposits are worked under the control of *U.S.* capital. 20% of the zinc deposits are worked with *British* capital. The chief exporters of zinc are *Australia*, *Belgian Congo*, *Canada*, *Italy*, *Mexico*, *Norway*, *Peru*, *Spain* and *Sweden*.

7. ALUMINIUM

Aluminium has come to occupy a very important position in the modern age of air transport. It is valued for its lightness and durability. Aluminium is found in all clay deposits but it is mostly recovered from bauxite and cryolite. Bauxite ore occurs extensively and it is mined in Europe and America. Les Baux in *South France*, *Hungary*, *Yugoslavia* and *Italy* are very important bauxite producers in Europe. Considerable bauxite deposits are also found in *Dutch Guinea* or *Surinam* on the north shore of South America. Bauxite reserves in *India* are also estimated to be 250 million tons, and Deccan and Chota Nagpur plateaus are known for it.

But all those countries that produce bauxite do not utilize it for aluminium production. Aluminium making is carried on by electrolytic process which requires intensive heat from electric furnace. The power must, therefore, be cheap. Therefore, aluminium producing countries are generally those which have the facility of cheap power. The U.S.A. is the greatest producer of aluminium in the world. 15% of the world's aluminium comes from this country. Before the second world war, *Germany* used to occupy the first position. *Great Britain* also produces about 30,000 tons of aluminium per year. Cryolite is found in Greenland and is worked by American company. *Norway*, *France*, *Switzerland* and *Canada* are other important producers of aluminium. The U.S.A. is not only the largest producer but also the largest consumer. The chief exporters of this metal are *Canada*, *Norway* and *Switzerland*. The U.S.A., *Germany* and *U.K.* occupy the most important position in aluminium import. The U.S.A. imports 74% of her requirement of bauxite from *Jamaica* and *Surinam*.

8. GOLD

Gold is an important precious metal which has always been recognized as a standard of value and soundness. Formerly, gold used to be the metal used in minting coins. Even now-a-days, gold is used for making ornaments and other items of luxury. Gold is also required for making teeth and medicines. Although gold is not an industrial metal, it is the sign of one's prosperity and its occurrence has always attracted mankind. *Alaska*, *South Africa* and *Western Australia* have been developed only after man discovered extensive gold deposits there. The total production of gold in the world amounts to about one million kilogrammes.

53% of this production or even more comes from *South Africa* which is the most important gold producing area in the world. As a matter of fact, *South Africa* owes all its economic prosperity to the gold mines there. In order to obtain gold, means of transport were developed and big towns sprang up. Therefore, it is said that the gold mines of *South Africa* are its back-bone. A long narrow belt like ridge situated on the northern end of the hill lying

between Limpopo and Orange rivers yields the greatest amount of gold. This region is known as "Witswaters Rand". Here the gold mines were discovered in 1885 and the rocks which contain gold are resting on granite and schist. This ridge extends from east to west for 100 miles but the gold mines are found in a 50-mile long and 25-mile broad belt. This area has also developed as a great industrial belt only because of gold. Johannesburg, Germiston, Bookberg and Cruselsdorf are the chief towns. All these towns are situated within a radius of 70 miles north and south of Johannesburg and are connected by a railway line. 1/6th of the European population and half of the total population of Transvaal lives in this very area. The work of gold mining is done with great effort and in the absence of sufficient labour, the work is done with great difficulty. Indian and Chinese coolies work in the gold mines. These workers have to live nearabout the mines and the mining companies look after their welfare and other needs. The dryness of the climate is another great hurdle in the way. Besides the State of Transvaal, some gold is also produced in Cape of Good Hope, Natal and Orange Free State.

Many parts of *North America* are very rich in gold. As a matter of fact, the whole region from Alaska in the north to Mexico in the south has rich deposits of gold. The following areas of North America are the most important for gold :—

- (1) Klondike in the Yukon basin of Alaska.
 - (2) Fraser and Columbia river basin in British Columbia.
- Recently gold has also been found in the Ontario State of Canada.
- (3) California.
 - (4) Plateau of Idaho.
 - (5) Montana and Dakota States in the Rockies.
 - (6) Colorado and Arizona plateaus.
 - (7) Ellaro in Mexico.

North America produces 1/4th of the total world production. *Australia* is extremely rich in gold. The first gold mines were discovered in 1851 and since then people from far and wide have been coming to settle in Australia so that the population of the continent has increased tremendously. Western Australia, Queensland and Victoria have rich deposits of gold. Balarat and Randigo in Victoria; Mount Morgan and Malstrus in Queensland and Calgoorlie and Coolgardie in Western Australia are important gold mining centres.

It has been predicted that the world's gold mining industry will be a spent force by the year 2000 unless there is a significant increase in the price of the metal now fixed at \$35 an ounce. The western nations would produce between 41 million and 42 million ounces annually through 1971, declining 32 million ounces by 1980 to 25 million through 1990, then tumbling sharply to about five million ounces a year by the end of the century, if no new mines are found.

The free world had economic ore reserves of between 900 million and 1,000 million ounces, most of which would be mined by the end of the century. However, he said a significant increase in the price of gold would make big additional reserves economic and would permit gold mining to flourish for many years to come.

Extensive deposits of gold have been found in the Lena basin of *Asiatic Russia*. It is said that these deposits are so extensive that they will rank next to those in South Africa and this region, in course of time, might even prove more important than South Africa.

Table XIII : 6—World Gold Production Excluding U.S.S.R.

(in thousands of ounces fine)

	1962	1966	1967	1968
Republic of S. Africa	25,492	30,880	30,535	31,170
Canada	4,158	3,274	2,962	2,700
U.S.	1,556	1,802	1,526	1,500
Australia	1,069	915	797	700
Ghana	889	684	763	750
Rhodesia	555	550	515	515
Philippines	423	450	491	500
Columbia	397	281	258	250
Japan	309	271	265	255
Mexico	237	214	183	190
Nicaragua	222	169	149	130
Congo	206	160	150	150
Brazil	127	208	200	200
India	163	120	103	120
Elsewhere	1,786	1,542	1,585	1,620
World Total Excluding U.S.S.R.	37,600	41,500	40,500	40,600
South Africa	67.8%	74.4%	75.4%	76.8%

9. SILVER

Silver, which is a valuable medium of exchange and is used in arts, is found in pure state as well as in combination with other metals like gold, lead and copper. It is at present widely used in the manufacture of surgical goods, in electroplating, in photographic industry and in dentistry,

North America produces 2/3 of the world production and the Rocky-Andes mountain system from the U.S.A. to Chile is very rich in silver deposits. Idaho, Montana, Nevada, Utah, Texas, Colorado and Arizona are the chief producing states in the U.S.A. Mexico,

Peru and Argentina have rich deposits of silver, while Canada in the north mines silver in the provinces of Ontario and British Columbia. It ranks fourth in the world.

In *Europe*, Western Germany, Yugoslavia, Sweden, Spain, Italy, France and Finland are the main producers of silver, W. Germany accounting for 60% of the total supply.

New South Wales and *Western Australia* also hold rich deposits of silver. *Japan* and *India* are the two countries of Asia which produce some silver,

Thus silver supply comes mostly from the new world and the production is largely financed by U.S. capital.

10. MERCURY

Mercury is a liquid metal which is now widely used in the pharmaceutical and instrumentation industries besides in silvering of mirrors. Spain, Italy, U.S.A., Mexico and Japan are the chief producers of Mercury.

The principal areas of production are :

Spain : Cinbad Real, Granada, Oviedo.

Italy : Tuscany, Idria, Trieste.

U.S.A : California, Oregon, Texas, Nevada, Washington. Arkansas.

Russia : Nikitova in Donetz Basin.

Mexico : Scattered small mines.

Demand and Supply Position—The fear that the world will have little mercury left after ten years at the present rate of consumption has been recently voiced.

In the growing chemical industry, the use of mercury is going up while fluctuations seen in output after 1945 must clearly engender pessimism. The idea that mercury output needed for mercury vapour bulbs will be adequate for an indefinite period is contradicted by the warning given, especially, as the U.S.A. uses mercury in new batteries for satellites.

The importance of mercury for medicine is accepted though fulminate of mercury does not find a place among modern explosives. The demand for mercury is still going up and the former estimate that 20,000 flasks a year will be sufficient to take care of all consumer requirements has to be revised. Importers are badly placed and the U.S.A. is bidding high for Mexican supplies even though Idaho is now a source of mercury like Arizona or Nevada.

There are only three major sources, if one leaves out Turkey, Czechoslovakia and Canada. Both Spain and Italy have supplemented Mexico for long but the last source is under U.S. control. As the Spanish civil war cut off supply from Almaden, the world has experience of scarcity. In the postwar period sulphide ores from Yugoslavia have provided sizable supply chiefly for Europe

and Asian countries are still handicapped as buyers though India may reckon on Yugsloavia supplies also through S.T.C. under trade pact. The E.C.M. will get Spanish plus Italian supplies. New sources have not been located and the scarcity of quicksilver is likely to be more serious than the scarcity of silver.

There seems to be no substitute for an essential import *e.g.* in the U.K.

11. MICA

Mica has come to be used as a very successful media of electrical insulation and with the growth of wireless telegraphy, aeronautical science and motor transport, its demand in the manufacturing countries of the world has gone up tremendously.

Mica, which is available either as sheet or as ground/powdered stuff, is commonly found in three varieties :

- (a) Muscovite or white mica.
- (b) Phlogopite or amber mica.
- (c) Biotite or Black mica.

More than three-fifths of the world supply comes from India which produces block or sheet type of muscovite quality. The other producers are Brazil, Canada and Africa. U.S.A. only produces 1% of the world supply. The main regions with areas of occurrence are given below :—

India—Bihar, Andhra (Nellore), Madras, Kerala, Rajasthan (Ajmer-Merwara).

Africa—Rhodesia (Lornagundi), Union of South Africa (Transvaal, Cape Province and Natal).

U.S.A.—North Carolina, New Hampshire.

Australia, France, Germany, Norway, Spain, Soviet Union, Japan and Argentina have very insignificant occurrences of Mica.

12. NICKEL

Table XIII : 8—World Nickel Output

<i>Country</i>	<i>Actual 1969 m. lbs.</i>	<i>Production Projected 1975 m. lbs.</i>
Australia	22.05	103
Botswana	—	29.2
Canada	459.9	791.3
Colombia	—	40
Dominican Republic	—	63.4
Germany	7.7	7.7

<i>Country</i>	<i>Actual 1969 m. lbs.</i>	<i>Production Projected 1975 m. lbs.</i>
Guatemala ...	—	60
Indonesia ...	—	120
Japan ...	122.9	145
New Caledonia ...	85	550
Philippines ...	—	75
Rhodesia ...	13.5	24.3
South Africa ...	9.7	13.7
United States ...	28.25	30
Venezuela ...		22
Total non-Communist		
Production ...	768.6	2,099.8
Cuba ...	81	90
Russia ...	240	250
Yugoslavia ...	—	7
Total East Europe ...	321	347
Total world Production		
	1,089.6	2,446.8

Table XIII : 9—Nickel Consumption
m. pounds

	<i>1968 % of total</i>	<i>1967 % of total</i>
Stainless Steels ...	300 37	300 37
Nickel Plating ...	121 15	122 15
High Nickel Alloys ...	114 14	114 14
Constructional Alloys Steels ...	92 11	87 11
Iron and Steel Castings ...	76 10	86 11
Copper and Brass Products ...	25 3	31 4
All others ...	79 10	70 8
Total Non-Communist World ...	807 100	810 100

CHAPTER XIV

Manufacturing Industry— Locational Factors

1. ESSENTIALS FOR THE GROWTH OF MODERN MANUFACTURING

Generally Speaking, a high standard of living is possible only if a country goes for rapid industrialization, through setting up of factories and workshops and through providing employments for the bulk of its working population in the industries. Every country has been interested in using science and technology for the purpose of industrialisation. There are six essential conditions or basic factors for the development of modern industries. They are : easy access to sources of mechanical power, raw materials, labour, capital, markets and transportation facilities. All these six conditions are not of equal significance; their importance varies with time, from region to region and from industry to industry.

Sources of Power—In order to manufacture goods, power is needed. At one time, power consisted mostly of human and animal power. When the factory system was started in the later part of the 18th century, direct water power, wood and coal were the sources of power. In course of time steam power based on coal had become the chief source of power. At present, however, electricity, petroleum, atomic energy are the most important sources. Hydro-electricity is of the greatest importance in areas that lack large amounts of coal and petroleum such as eastern Canada, Switzerland, Sweden, Italy, Finland, Brazil, Japan and India. Till recently the general tendency of industries is to be located near the sources of power.

Raw Materials—Raw materials are essential for modern manufacturing. These materials may come from agriculture or from other primary occupations. They may be semi-manufactures—the product of one industry becoming raw material for another industry. Raw materials may or may not be a dominant factor in the location of factories and workshops.

Labour—Labour is an essential in all factories, though the recent tendency has been to go for automatic or semi-automatic

machinery. Most modern factories require intelligent, highly skilled and healthy workers. At the same time there are many factories which require labour mostly of the unskilled type. Labour is mobile between industries and regions. It is mainly because of this reason that labour is not regarded as a significant factor in the location of industries.

Capital—Capital is another essential factor for modern manufacturing. For small industrial units, capital may come from local sources. For large industrial units plenty of capital is needed and, therefore, it is mobilised or collected from the whole country and sometimes even from other countries. In a sense, capital is more mobile than labour and, therefore, it does not influence so much the location of industries.

Markets—All manufacturing is undertaken for the market. Many industries producing bulky and heavy products are located near the markets. For example, sugar, cotton textiles, agricultural machinery, petroleum etc., are produced near the markets.

Transportation—Finally, transport facilities constitute an important factor for the development of industries. Transportation is required for bringing raw materials and for marketing finished products. At present there are various types of transport facilities available to a factory. The greater the number of sources, the lower would be the cost of transportation. It is a fact that all industrial regions all over the world have highly developed and efficient transport systems. Since modern industrialisation is based on markets, efficient means of transportation to serve the markets are a necessity.

Apart from the above six essential conditions for the growth of industries, there are many other conditions which favour industrial development. Good climatic conditions, plenty of water and sufficient building space will also help in the growth of industries in a particular region. Besides, a favourable and encouraging attitude of the Government, specially through beneficial taxation and subsidies will be very helpful. In a country like India the Government can bring about rapid industrial development through development of power, transport and other essential facilities.

2. THE THEORY OF INDUSTRIAL LOCATION

To understand and evaluate the location pattern of industrial growth, it is essential to study the economic forces which induce certain industries to be located in particular areas or regions. The German economist Alfred Weber has given the first systematic theory of industrial location. Weber classified the causes of industrial location under two headings—primary causes and secondary causes.

Primary causes refer to the regional distribution of an industry; they may be known as *regional factors*. Transportation

cost and labour cost are two regional factors. Transportation costs are determined by (a) weight to be transported and (b) distance to be covered. Every industry will generally be drawn to those areas or sites which have the most favourable transport relations with regard to the sources of raw materials as well as of markets. Weber discusses two conditions—i.e., the type of raw materials used and the nature of their transformation into products. Some raw materials are to be found everywhere, e.g., clay, bricks, water, etc. But some raw materials are localised, for example, iron ores, other minerals, wood etc. The latter naturally exert a great influence on the location of industry. Further some raw materials are 'pure' and get converted completely into the final product; raw jute and cotton are good examples. On the other hand, some raw materials are weight-losing materials; sugar cane, coal etc. are weight losing materials. These exert a greater influence on industrial location than pure raw materials. Weber's conclusion is : The proportion of the weight of localised materials to that of final product exercises a determining influence on the location of manufacturing industries. If this proportion is high—i.e., if the material index is high—production tends to be located near the place of deposits and if low, it lies at the centre of consumption.

This is the main thesis of Weber. But he mentions labour cost to show that if there are differences in labour costs, the location of an industry may deviate from optimal point of transport orientation. Weber mentions secondary factors and discusses them as agglomerating and deglomerating factors. Agglomeration refers to the advantages of cheapening of production due to the concentration of an industry. These advantages refer to the external economies. The opposite tendency of deglomeration leads to a reduction in the cost of production on account of decentralisation. This is usually caused by high land values due to excessive concentration and high local taxes.

Apart from Alfred Weber, many others especially Sargent Florence have contributed much to the study of locational pattern of industries, both from deductive and inductive angles. During recent years, the study of industrial location has aroused keen interest not only for analysing the present framework of industrial location but also for formulating a realistic policy of industrial planning.

3. FACTORS AFFECTING LOCATION OF INDUSTRY

The desire for the development of industries has necessarily led to the search for suitable locations. At one time, the emphasis was on the nearness to raw materials and coal, and industries were located in places where these were available. But the development of electric power, the transmission of electricity to distant areas and the discovery of new sources of power have made it possible to set up industries in these areas within the reach of raw materials and markets. The presence

of raw materials, availability of mechanical power, machinery and labour supply and nearness to markets—all these have influenced concentration of manufacturing in some areas. Whatever may be the causes, there is a definite tendency for industrial activities to tend to group together than to disperse. This is what is known as localisation of industries.

The modern industrial regions of the world have grown up where (a) coal and hydro-electric power or petroleum are available; (b) raw materials are produced; (c) in or near large centres of population where there is an abundant labour supply and a good market of consumers; and (d) at port cities, to which both materials and labour can be brought at reasonable expense and from which the finished products can readily be shipped to wider markets.

Primary Factors

(i) *Mechanical Sources of Power*—Goods can be manufactured only through the use of power, either animate or inanimate. At one time, man used his own labour or the labour of animals to make things. But in course of time, he came to use direct water power, wood and coal. The early workshops and factories were, therefore, located near these sources of power, for men did not know how to transport power. Real industrial development in the beginning of the 19th century started with the use of steam power. Coal was used to generate steam power from water to turn machinery. Besides, coal was used directly for the treatment of raw materials, as in the smelting of iron ore. As coal is a bulky material of relatively low value, it cannot be transported over long distances, except by water, without incurring high transport charges. Naturally, manufacturing industries started concentrating near coal fields. This was particularly so in the case of iron and steel industry which depended upon cheap supply of coal as a source of both fuel and power.

The concept of "nearness to sources of power" has changed considerably. In the past, it was used in the context of physical presence of power in the immediate neighbourhood. Today, this "nearness" means that power is available without much difficulty from the point of view of time and cost. If the source of power is coal, its availability near the location is an advantage because coal is bulky and it will increase the cost of production if it has to be brought from long distances. "Nearness" may be even 1,000 miles, if the freight charges to industrial site are reasonable. The problem of distance in the case of petroleum has been solved by the use of huge tankers and pipelines for carrying crude to the refineries.

It may be observed that the newer sources of power—petroleum, fuel oil, gasoline and natural gas—have tended to flow to existing centres of industries by means of cheap pipelines or tanker transportation; they have not attracted industries themselves. It is

true that the better distribution of electricity and petroleum products are counteracting the tendency of industrial concentration but they cannot themselves bring about complete decentralization of manufacturing. Even now, areas where power is available at low cost and where there is concentration of population constitute great markets and will continue to be the most logical sites for many types of industry.

(ii) *Access to Raw Materials*.—Though raw materials are essential for manufacturing industries they may or may not, be a dominant factor in the location of factories. Wherever the raw materials are very bulky and hence transportation charges are very heavy, manufacturing tends to be concentrated near the sources of raw materials. Good examples are the making of bricks and tiles from clay, the manufacture of glass from sand, cement manufacture from limestone and clay, sugar manufacture from beet or cane etc. Similarly, most ores, because of bulk and low content of the mineral, are in many instances concentrated mechanically or smelted at or near the mines before being sent to industrial regions for refining and final manufacture. Bulk and perishability of some raw materials cause them to be processed in or near the region of production—the production of butter, cheese, and milk products, the canning of fruits and fruit juices, etc., are good examples of industrial location mainly influenced by access to raw materials.

(iii) *Nearness to Markets*.—An essential condition for manufacturing is a market which implies people with a desire to have manufactured goods and with the purchasing power to buy them. Industries producing bulky products are most economically produced and marketed in or near consuming regions. For instance, industrial machinery, bulky and heavy products and industrial chemicals, are generally made in the great manufacturing regions that are their major markets. East central North America and Western Europe are the largest consumers of petrol and therefore, refineries are set up there even though they are not producers of oil.

Markets are the chief consideration of industries, for it is to supply markets that industrial development is undertaken. The markets must be easily accessible. The accessibility of markets implies the absence of governmental obstruction and the existence of good and cheap transportation. Industries, therefore, tend to be developed as near the market as possible. A good example is the extension of cotton textile industry into the interior of India, after its initial location in Bombay.

(iv) *Good and Cheap Transportation Facilities*.—Cheap means of transportation are a necessity for any industrial development. For, every manufacturing unit requires the movement of raw materials and finished goods. The more bulky the materials to be moved, the higher will be the transport charges. The location of

an industry in an area will, therefore, be determined by the transport charges of the raw materials to the plant and of the finished product to the market. In fact, the nearness to the sources of power and of raw materials and proximity to the market are related to or dependent on the availability of good transport facilities. It is important to remember here that cheap transport should also imply speedy transport. The decline of canal transport in many parts of the world is explained by the fact that it was slow though cheap. Another point to remember here is that just as transportation facilities help in the localisation of an industry in a particular area, the location of a particular industry will also help in the expansion and development of transportation.

(v) *Labour*—Labour is generally mobile and, therefore, it may not be ordinarily significant in the selection of factory sites. However, labour, specially skilled labour, does influence the location of industries in particular areas. For instance, diamond cutting in Amsterdam and Antwerp, watchmaking in Switzerland, the dyeing and printing industry in Farrukhabad and the glass industry in Firozabad in India are examples of location of industries based on the presence of skilled labour. Once certain industries, requiring special skills, become established, they continue and over-expand in those areas in part, because of the labour supply. Cheap labour is definitely significant in attracting industry in a particular region, as the setting up of the cotton textile mills in India, Japan, Brazil, etc., clearly proves. The manufacturing of the small-scale match factories in Tamilnadu is explained partly by the terribly cheap unskilled labour available there.

(vi) *Climate*. Soil and climate may ordinarily be of no importance for the production of certain manufactured goods, but many industries based on agricultural products are dependent on soil and climatic conditions. The cotton textile industry was located in Bombay because of favourable climatic conditions. The location of the cotton textile industry in Lancashire and the woollen textiles in Yorkshire is primarily influenced by climatic conditions. Excessive moisture is undesirable to the manufacture of candy, cement, bricks, etc. and hot and dry weather is regarded bad for the manufacture of leather goods. In this connection, we may mention the need for water for manufacturing of many products. Water may be required for cooling the machinery or for washing the raw materials and so on. This explains the location of the steel mills, paper mills and jute mills on river banks or in those regions where there is plenty of water.

Secondary Factors

Apart from the primary factors which are responsible for the location of industries, there are a number of secondary factors also which explain the location of industries.

(a) *Momentum of an early start*. In some cases, one or two industries might have come up in some places but with the passage

of time, these places gain importance and attract new industries. When a number of factories are started in a place, facilities for transport, banking, repairs and maintenance, etc., are easily available. Labour of different types is attracted. England is a good example of a country which had the advantages of an early start in industrialisation. In India, Bombay is a good example for this point.

(b) *Industrial Atmosphere*—A certain industrial atmosphere is created in a particular place or region and this is responsible for the location of a number of industries. Coventry in England is a good example of a place where there was not much change of population but because of the special industrial atmosphere waves of different industries came to it. Kanpur in India is a good example of this point.

(c) *Special Advantages of a Place*—Some places provide special advantages. For example, port towns provide excellent advantages for import and export of raw materials and finished products. There is, therefore, a natural tendency for industries to be located in ports. At one time, the princely states in India did not charge income-tax and also offered some advantages in the matter of labour and capital. It is for this reason that many manufacturing industries were started in the princely states.

(d) *Personal Factors*—In some cases, personal likes and dislikes of powerful individuals may be responsible for the initial location of an industry. It is said that Henry Ford started the manufacture of cars in Detroit in the U.S.A. because it happened to be his native town. Lord Nuffield selected Cowley in England for his factory because the school in which his father was educated happened to be for sale. It is, however, important to emphasise that personal factors promoting industrial location will have permanent significance, only if the localities chosen have economic advantages too.

(e) *Military and Strategic Reasons*—In recent years, military and strategic considerations are playing an important part in the location of industries. During wars, the main targets of air attack are armament and munition factories supplying essential products for war. Such factories are naturally located far beyond air attacks. A good example is the location of the MIG factory at Nasik in Maharashtra and the Tank factory in Tamilnadu.

Since the private industrialists think only in terms of profitability of a particular location, they do not bother about the general locational pattern. On the other hand, the government of a developing country has the great responsibility of bringing about the best location of industries and balanced development of the country. The Government has to remove regional jealousies and conflicts in the location of particular industries, such as the setting up of iron and steel plants, oil refineries and atomic energy plants. It is because of political and other considerations, that

a Government may set up a petro-chemical complex or a steel complex in an area which may not have the necessary economic advantages.

Thus, in the location of a manufacturing industry or plant, both economic and non-economic considerations play a part. Importance should be attached to economic advantages enjoyed by a particular region. But sometimes non-economic considerations may also play a significant role. In this connection, mention may also be made of the invention and their application, stability of Government, taxes of all types, favourable or unfavourable legislation, control of patents, inherent native ability of the people, management, and developmental research. The significance of all these things varies greatly in time, from industry, and from region to region.

4. LOCATIONAL PATTERN OF SOME PROMINENT INDUSTRIES

It is useful to refer to the location of some prominent industries in India and in other countries. We shall study the cotton textile industry and the iron and steel industry.

The Cotton Textile Industry

The *climate* has a very great importance in this industry. Cotton spinning requires humid atmosphere. In the dry weather, the yarn is easily broken. Now-a-days, humidity is controlled inside the mill by means of mechanical appliances but this is more expensive and therefore, it is always preferred to have natural conditions of humidity. Specially in the production of fine cloth, this facility reduced the cost of production to a very great extent.

Water in sufficient quantity is also of great importance. For washing, dyeing and several other works, water in sufficient quantity is required. That is why we find that the cotton textile industry is established everywhere along the canals and rivers.

Nearness to Coal or Hydro-electricity is a very great advantage to this industry. Because of this factor, there is another facility also that the women and children of the workers employed in the power house form a very cheap labour force for the textile mills.

Cotton textile industry flourished most in areas where *skilled workers* and traditional weavers have been living for a number of years.

Cheap transport is very necessary because cotton textile goods are cheap and their markets are situated thousands of miles away from the areas of production. Because of the cheap transport, it is profitable to import raw material, machinery and coke.

Market plays a very important part and the incentive for the growth of Japanese and British cotton textile industry has been given by the very large scale markets provided by their extensive empires. When they lost control over their empires, their cotton textile industry also suffered a set-back. Indian cotton textile industry has also been very much helped by the Swadeshi movement within the country which was responsible for developing the home market.

The Indian cotton textile industry was localised, till recently, in the Bombay region which claimed more than two-thirds of the loomage. A concentration of the cotton textile industry in Bombay till the First World War was the result of the following factors :—

(a) Bombay enjoyed a humid climate required for cotton spinning and it had also the advantage of a good supply of raw cotton from the black cotton soil of Maharashtra.

(b) Bombay enjoyed excellent transport facilities in regard to raw materials and markets;

(c) The railways charged lower freight rate from and to the port towns, and this increased the transport advantage of Bombay over the up-country centres;

(d) Being a commercial and financial centre, Bombay could offer banking, financial and marketing facilities which no other town in India could offer at that time.

These factors were responsible for the high concentration of the cotton textile industry in Bombay. But after 1925 there was a gradual dispersal of the industry to different parts of the country due partly because of expansion of transport and communication facilities and partly because of the expanding internal market for cotton piece-goods.

In the United Kingdom, the Lancashire region held the leadership of the cotton textile industry in the world. This region had pure water needed in bleaching, dyeing, printing and other finishing mills. The Lancashire coal fields north of Manchester supplied excellent cheap fuels; the great salt deposits south west of Manchester furnished chemicals for bleaching, dyeing and finishing. Humid air facilitates spinning and weaving. The Manchester ship canal facilitated the import of raw cotton and export of finished products. The region had millions of skilled labourers and many commercial organisations that promoted every branch of the cotton industry and trade connection with all parts of the world. Thus Lancashire had a world reputation and it developed most of the textile machines which were exported to the other parts of the world. However, these advantages were gradually lost and Lancashire lost its eminent place in cotton manufacturing. In 1914

nearly 600,030 persons were employed in the cotton and spinning mills of Lancashire but in the middle of 1960's it had come down to 150,000—no other country has had such a decline.

Iron and Steel Industry

There are many processes in modern steel manufacture. The first process is to mine the iron ore from the earth. The next step is to smelt it and produce pig iron which is further purified into steel. Steel can be either cast into moulds to solidify into the desired shape, or shaped mechanically.

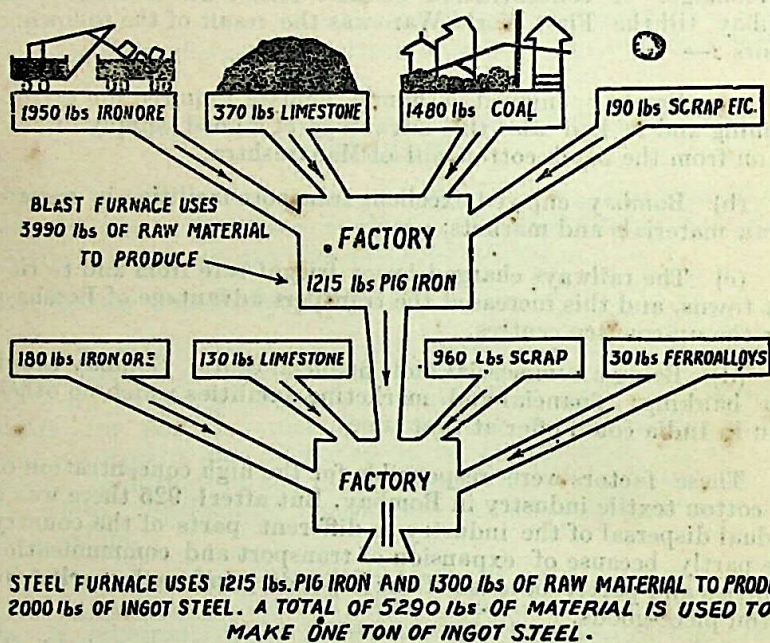


Fig. 37.

In the steel furnace, steel is pumped into ingot moulds. In the rolling mills the steel ingots are reheated and converted into infinite variety of sizes and shapes. Eighty per cent of all steel passes through rolling mills. Forging is another method of shaping steel by means of power driven hammers. Casting consists in converting steel into desired shape by means of specially prepared moulds. Thus there are three major steps in the production of steel namely, (1) smelting of iron ore into pig iron in furnace. (2) conversion of pig iron into steel in the steel furnace and (3) the shaping of the steel by rolling, pressing or casting. The making of a ton of pig iron requires 1.44 tons of ore, 0.9 tons of coke, 0.4 tons of lime-stones, 0.2 tons of cinder and scrap and 4.5 tons of air.

In order to reduce the cost of production modern steel plants are large in size and integrated in function. A Plant is said to be integrated, if coke ovens, blast-furnaces, steel furnaces and rolling mills are situated at the same place. The cost of production of steel is lower if the size of the furnace is large. Similarly the transport cost is lower if the tonnage is larger in size. The rolling mills are also large and specialised. All these functions are performed at one place and therefore, there is a great deal of saving in fuel and transport costs. Moreover scrap produced in the rolling mills is used in the steel furnace as raw materials.

The localisation of iron and steel industry depends upon the following conditions :

(1) 2 tons of coal and one ton of limestone is required for smelting one ton of iron ore. Therefore, it is better to have iron and steel industry near coal bearing areas. Iron ore and limestone must be available closely.

(2) Presence of a big river or water reservoir is essential in order to temper steel. It is because of this consideration that steel factories are established near the rivers or on the banks of lakes.

(3) Things made of steel are normally very heavy and the raw material required for the steel making is also bulky. Therefore the steel industry should be near the market and cheap transport must be available to bring the finished products to the market and to bring raw materials to the factory.

(4) Steel making requires skilled labour and trained workers in sufficient number.

(5) In the blast furnaces of steel making, a lot of coke, gas and electric energy is also produced. Therefore, in order to utilize this there must be thickly populated centres nearby.

Iron and steel industry is a highly localised industry and affords a good illustration of the marked advantages of a suitable location. The industry was localised in Bihar and England but in recent years new factories have been set up in Orissa and Madhya Pradesh. A heavy basic industry like iron and steel is naturally attracted to places where iron ore and coal are situated. The industry also requires limestone and dolomite. As all these raw materials are weight losing, their pull is greater than the pull of the market. The industry tends to be located at the point of minimum transport cost which may lie either at the sources of iron ore or coal deposits or near the market or anywhere in between these three. The Tata Iron and Steel Company (TISCO) is situated in the Singbhum area in Bihar and the company is fortunate to get its iron ore from a distance of 30 to 50 miles and its limestone from close vicinity of the works. The TISCO could obtain freight concessions from the railways. Finally, the works

are located at a distance of 150 miles from Calcutta and thus could enjoy excellent facilities for export. TISCO, therefore, enjoys ideal location—best transport relations in regard to raw materials and market.

The United Kingdom has distinct advantages for a large modern iron and steel industry. Firstly, it has large deposits of high quality coal : secondly, it has ready access to the sea through many of her ports ; and finally, the densely settled areas at home provide a compact market for the products of the steel industry. The access to the sea is probably the greatest advantage of United Kingdom. In the United Kingdom as well as in the United States the growth of the steel industry during the late 19th century occurs on sites where both coal and iron were at hand. At present, however, most units are far more oriented towards markets than to raw materials or power sources. Many integrated iron and steel mills have been set up in the United States of America in order to serve the rapidly increasing middle west and other markets. In Japan, the steel industry is located on the sea coast, since the industry is based on imported iron ores. About 80 per cent of iron ores is imported. Import of raw materials and export of finished goods are facilitated by the location of the steel plants on the sea coast.

CHAPTER XV

Some Important Producer And Consumer Goods Industries

1. IRON AND STEEL INDUSTRY

Steel is the king pin of industry and enters into every aspect of economic development, from the construction of railways to the building of houses. Steel, the mainspring of modern industrial civilization, is one of the most important of all basic materials not only in industry, but in all phases of modern life. There is a close connection between the level of steel production and industrial status of a country. The production of steel has also probably the highest correlation with national income in different countries.

The work of smelting iron ore and preparing steel is done on a small scale in almost every country of the world but of the total world production of crude steel, the U.S.A. and the U.S.S.R. produce 25.6% and 20.7 per cent, respectively.

The highest per capita consumption of steel is in Sweden—545 kilos.

Table XII : 1—Per Capita Steel Consumption

(in kilos)			
U.S.A.	540	Eastern Germany	378
Czechoslovakia	487	Canada	377
Federal Republic of Germany	473	U.K.	368
Australia	389		

By contrast, steel consumption in some of the developing countries is less than 10 kilos per capita.

U.S.A.—Iron and steel industry of the U.S.A. is almost entirely confined to the areas situated to the east of the Mississippi river. Here coal and iron are found in plenty and there is a developing market for the products of the industry. The coal of western Pennsylvania is readily available while iron ore from the

Lake Superior region can be easily brought. Pittsburgh in the upper Ohio valley is the main centre. As a matter of fact, the triangle made by Pittsburg, Cleveland and Buffalo is the most important steel making area of the U.S.A. Otherwise the iron and steel industry is found stretching along the whole course of—Appalachian mountains. Pennsylvania, Ohio, Indiana and Illinois are the leading producers of pig iron (including ferro-alloys).

The following are the chief steel making districts of the U.S.A.—

1. *North Appalachian region* which includes western Pennsylvania and eastern Ohio. Pittsburgh is the chief centre and 42.5% of the blast furnace capacity of the country is found here. This region is very well served by lines of transportation. There are nine different trunk railway lines besides the canals of the Ohio river which can take large steamers of 10 to 12 thousand tons. The nearness to abundant supplies of coking coal, a very flourishing market because of the dense industrial population and the development of transport lines are the great advantages enjoyed by this region. Agricultural implements, tractors, structural steel, motor cars and other automobiles are some of the ways in which steel is utilized. The railways are, however, the largest consumers of steel in the area. The only disadvantage here is that iron ore has to be brought from the Lake Superior region which is at some distance.

2. *Lake Region*—This consists of three different units :—

(a) *Detroit, Cleveland and Buffalo* on lake Erie. This is the main centre of U.S. motor-car industry. 31,000 motor cars are manufactured in every 24 hours and the average production *per capita* is one motor car for every four Americans. Cheap transport, situation in the midst of thickly populated region, demand for trucks and tractors in the nearby agricultural area and the presence of trained transport workers in Detroit suburbs have very much contributed to the localisation of motor car industry here.

(b) *Chicago* on lake Michigan. Chicago is a great centre of the stupendous meat packing industry of the U.S.A. and it is often called the world's 'Slaughter house'. As such, the chief lines of steel manufacture are cutlery, knives and cans.

(c) *Duluth* on lake Superior. This has got a very poor hinter land consisting of forest, farm and ranching country. As such there is little demand for iron and steel goods but the presence of iron ore has led to the establishment of steel industry.

These three regions are nearer the iron ore but away from the coal of the Appalachian region. Then again, the centres are situated a little too far away from the consuming markets.

3. *Atlantic Region*—New York, Philadelphia, and Baltimore are the most important areas of steel manufacture that have developed due to the presence of a thickly populated market.

Being situated on a sea-board, they can import iron ore from outside, the chief being Cuba and Chile. The industry here enjoys a ready access to foreign markets. Electric motors in New-York and railway engines and steamships in Philadelphia are the chief lines of manufacture.

4. *South Appalachian Region*—Alabama State is full of raw materials required for the iron and steel industry. The iron ore is no doubt of a low grade but it is found mixed with lime and, therefore, it is self-fluxing. The only drawback here is the lack of large consuming centres. *Birmingham* is the chief centre and there is a large amount of pig iron left as surplus which is sent for consumption to the North.

The iron and steel industry in the U.S.A. has the facility of having almost all the raw materials required, available at home. Because of the availability of capital in sufficient quantity, the American steel industry has a larger number of integrated plants where manufacturing cost are much lower. The bulk of the output in the U.S.A. is meant for consumption at home. The exporters are, therefore, very little. Hence, there is regional as well as commodity specialization in the iron and steel industry of the U.S.A. The largest consumption of iron and steel in the U.S.A. is in the manufacture of motor cars, tractors and machines. The main products of U.S. steel industry are automobiles, refrigerators, washing machines, industrial machines, rail road cars etc.

U.K., Japan, Latin America, Canada, Philippines, U.A.R., Italy and Thailand are however the biggest consumers of the products of U.S. iron and steel industry.

U.S.A. itself is the largest producer and consumer of steel in the world.

U.S.S.R.—The Russian steel industry has shown great development during the last so many years. It now occupies second position in the world and from 42 lakh tons each of pig iron and ingot steel and 35 lakh tons of rolled steel in 1913, its production in 1967 has become 900 lakh tons of pig iron, 1100 lakh tons of ingot steel and 650 lakh tons of rolled steel. The main reasons for this spectacular growth are (a) extensive deposits of coal and iron ore ; (b) excellent transportation facilities ; (c) wide dispersal of plants on the basis of local availability of raw materials (d) vast untouched reserves of raw materials—coal, iron ore and manganese (e) great and rapid development in metallurgy ; (f) government backing to the increase in production on planned targets (g) spirit of competition to get better of the U.S.A. and to establish a position in the world. Machinery, machine tools and tractors are the main lines of manufacture in the U.S.S.R. The steel industry of Russia has developed the most in the following four regions :—

1. *Tula-Moscow Region*—This is the oldest steel making region in Russia but during recent times, its importance has grown

very much less. The main centres of coal production are Gorki, Lipetsk and Tula. Motor cars and other consumer goods are the chief lines of manufacture.

2. *Southern Ukraine*—Here coal is available in the Donetz basin and iron ore supplies come from Krivoirog. The facilities of transport, labour supply and market gave it the momentum of early start. Before the first world war, 75% of Russian pig-iron came from this area. Even now 45% of the country's steel production comes from this belt. Krivoirog, Stalingrad, Voroshilovgrad, Odessa and Rostov are the most important centres. Motor cars in Voroshilovgrad and agricultural machinery at Odessa and Rostov are the chief lines of manufacture.

3. *Southern Urals*—This region has been growing up since 1937 and about 20% of the total production comes from this region. Magnitogorsk is the chief centre in this region. It has the advantage of having high grade deposits of iron ore and flux nearby. Coal comes from a distance of about 1200 miles in western Siberia. It sends iron ore to Kuznetsk basin and gets coal from there. Heavy steel factories are found in this region.

4. *Kuznetsk Basin*—In the western Siberia, coal is found in abundance but iron ore has to be imported from the Ural region. Motor cars in Stalinisk and aeroplanes in Omsk are the main lines of manufacture.

Consumption at home is slightly less than the production. Therefore Soviet steel products are exported to countries of East Europe, Africa and Asia on the basis of bilateral agreements. Lack of extensive deposits of high grade coking coal and iron ore on the one hand and uneconomical cost of operation, on the other, come in the way of Soviet steel gaining world leadership through successful competition.

U.K. has been a pioneer in the manufacture of steel but recently it has come to occupy fifth position among the producers of the world.

There are certain very great facilities provided by nature for this industry. Coal and iron ore are found near each other so that there is no expenditure on transport. Because of the nearness to the sea, there is no difficulty whatsoever in the import of raw material and the export of finished goods. The most important steel producing centres are the following :

1. *Midland Region*—This is also known as 'Black Country' and here the iron and steel industry came to be established the first. Birmingham, Coventry, Dudley and Raddich are the most important centres. As this region is situated at a distance from the market, such steel goods are manufactured here, as have great value. Motor cycles, Railway engines, electric motors, motor cars, rolling stock, bridges, chains and needles are the main lines of manufacture.

2. *Sheffield*—Sheffield is known for the manufacture of cutlery and manganese, chromium and tungsten steel.

g. *North East Coast*—Here Tees and Tyne river basins are the seats of ship-building and engineering industry. Iron ore and coal are found together, lime stone is also not very far and further, iron ore can be imported easily from Sweden and Spain. The nearby forests yield wood and there are skilled workers all along the estuary of the rivers. The result is that this region has specialised in making ships and engineering goods. Middlesborough is the largest producing centre.

4. *Furness Region*—Barrow is the chief centre and ship-building is the main industry.

5. *South Wales*—Swansea and Lamley are the chief centres where tin plates are manufactured.

6. *Clyde Valley of Scotland* is famous for Engineering goods and ship-building and Glasgow, Frenock and Dombarton are the chief centres.

Great Britain is world famous for *ship-building and engineering industry*. Great Britain manufactures ships for all parts of the world and the deep estuaries of the river, presence of coal and iron in proximity, insular situation and extensive empire with which contact was only possible by means of ships, have been the most important reasons responsible for the development of ship-building industry here. The following four regions are the most important in this respect.

(a) *The Clyde Region* manufactures warships and heavily armed vehicles.

(b) *North Eastern Coastal Area* manufactures all kinds of ships.

(c) Destroyers, U-Boats and merchant ships are manufactured at *Barrow in Furness Region*.

(d) *Birkenhead* makes battle-ships, dredgers and luxury liners.

British steel goods are well known for their quality and finish. U.S.A. and Commonwealth countries are the chief markets for British goods. On the continent of Europe, however, it has not been able to make much headway in the face of the West German competition. The formation of European Common Market and the European Free Trade Area comprising of Norway, Sweden, Switzerland, Australia, Portugal and West Germany has adversely affected Britain's export trade of steel and steel goods.

If Britain has to retain her dominant position in steel exports, crude steel production will have to be increased and the rising costs will have to be drastically cut down.

The chief handicaps that the British steel industry has to face are :

- (a) Higher wages,
- (b) Obsolete equipment,
- (c) Tight price policy,
- (d) Expensive coal in insufficient quantity.

Japan—The history of development of modern iron and steel industry in Japan dates back to 1896 when the Government of Japan decided to establish the Yawata Iron and Steel Works.

The phenomenal growth of Japan's iron and steel industry attaining an annual ingot steel production of 39.8 million tonnes in 1964, 26.3 per cent above the previous year, placed Japan as the third largest steel producer in the world, after the United States of America (115.15 million tonnes) and Soviet Union (84.35 million tonnes). The present state of development of iron and steel industry in Japan presents a very interesting study, particularly because of the serious damage to the production facilities in the World War II when the output dwindled to almost nothing.

Steel products continue to be the largest single export commodity of Japan, accounting for 14.1 per cent of her total export worth \$9,776 million.

The balance of the increased production of steel is absorbed in domestic engineering industries. The import of iron and steel products amounted to about 3.46 million tonnes. The comparatively low wage level of Japanese steel workers coupled with high output of steel per worker contributes towards low cost of production.

In view of the great dependence of iron and steel industry on the imported iron ore, coking coal and scrap, the main steel works are located near the sea coast. The main producers are the Yawata Iron and Steel Co. (7.682 million tonnes in 1964), Fuji Iron and Steel Co. (6.362 million tonnes), Japan Steel and Tube (4.317 million tonnes) (N.K.K.), Kawasaki Steel Corporation (4.342 million tonnes), Sumitomo Metal Industries (3.866 million tonnes) and Kobe Steel. These steel works contribute about 67 per cent while a large number of small producers contribute 33 per cent of the national production.

Japan does not have good grade iron ore for smelting in blast furnace and coking coal suitable for the production of blast furnace coke. Indigenous high volatile coal of poor coking index can be blended with imported coking coal. In view of the inadequacy of domestic iron ore and the quality of coal, the iron and steel industry is largely dependent on the importation of these essential raw materials.

The increased production of pig iron has been accompanied by sustained expansion of imports of iron ore, coking coal and

steel scrap. The industry depends upon overseas supply sources for at least 90 per cent in the case of iron ore and 65 per cent in the case of coking coal.

North America account for 51.1 per cent of the total exports from Japan. Another selling feature was the fact that steel exports to China rose by 300 per cent over the previous year's figures.

West Germany holds the fourth position among the world producers of pig iron and crude steel and is the third largest consumer of steel in the world. In 1966-67, its production was as follows :—

(000 metric tons)

Pig Iron	28,000
Crude Steel	37,000
Rolled Steel	26,000

The following factors have helped this country develop its steel industry in spite of defeat in the two world wars and loss of territory :—

(a) Iron ore from Lorraine; (b) High grade coal of Ruhr area; (c) Bessemer process of steel production; (d) A very cheap navigable waterway in the form of Rhine; (e) High technical know how in respect of metallurgical industries; (f) Highly skilled and disciplined labour force; (g) The active cooperation of the European Common Market and the European Free Trade area in providing it with markets.

The most important areas of steel production are :—

Ruhr Valley (West Phalia) :	Essen, Dusseldorf, Dortmund,
(35 miles × 60 miles)	Solingen and Hagen
Hamburg	Ship-building
Frankfurt	Ferro-alloys

West German steel is known for its quality but it has to depend on the iron ore imported from France, Spain, Sweden and Algeria.

India—The following factors have helped India to start Iron and Steel manufacture :—

- (a) Large deposits of Iron Ore and Coal in close proximity,
- (b) Presence of Limestone and Dolomite in Iron ore areas,
- (c) Increasing demand,
- (d) Government's impetus,
- (e) Need to save foreign exchange for development, and
- (f) Traditionally skilled labour.

Tatanager (Bihar); Burnpur and Kulti (Asansol—West Bengal); Durgapur (West Bengal); Rourkela (Orissa); Bhilai (Madhya Pradesh); and Bhadravati (Mysore) are the main centres of steel production and heavy rails and fishplates, heavy and light structures, sleepers, tin plates, sheets, bars, etc, are the main-lines of manufacture.

There was a time when India led the world in iron and steel production. It is a proof of the high value set on Indian steel in ancient times that, despite inadequate transport facilities it found its way to Europe and other parts of the world. From India came the famous Damascus steel from which the swords and armour of the Crusades were fashioned.

Iron and steel industry occupies a pivotal position not only in the national economy but also in world perspective, and it has given rise to numerous ancillary—Engineering and Transport industries—that have developed in India during the last 10 years. But serious problems confront the country in the achievement of its target of sixteen million tons of steel; (1) there is the shortage of trained personnel; (2) the severe shortage of coking coal; (3) the shortage of refractories for the coke ovens and steel making furnaces; (4) the lack of fabricating capacity which was far short of the estimated requirements of about 350,000 tons for the steel industry even during the Second Five Year Plan alone; (5) the most serious difficulty of all is the transport bottleneck, the severe shortage of locomotives and wagons. It is generally realised that for every ton of steel manufactured, 5.5 tons of raw materials and coal have to be transported. Thus the manufacture of even ten million tons of steel ingots will involve the transportation of some 55 million tons of raw materials and coal. Although it was hoped that the steps for the expansion of the Railway facilities envisaged under the Three Five-Year Plans will be adequate to meet the transport requirements of the country, including the steel industry, it was not possible to achieve the Third Plan target. There was a shortfall of about 2 million tons of steel.

2. COTTON TEXTILE INDUSTRY

The textile industry of the world consists of the manufacture of cotton, woollen and silk goods. Jute and linen are other branches of textile industry. But the most important is the *Cotton Textile Industry* which supplies the clothing requirements of the majority of mankind.

Cotton is the raw material for the cotton textile industry. The long staple cotton gives us fine cloth while short staple cotton is used for manufacturing cheap, coarser cloth. Cotton has been called the *King* in the U.S.A. because it is the most profitable crop. In the U.K., the cotton is *bread*, because it gives employment to several million people. Cotton has been called *power* in Japan, because by means of cotton textiles, Japan could

defeat such well established countries as the U.K., in the international field. As against the iron and steel industry, raw material is not the deciding factor in the localization of this industry, because its raw material is sufficiently light and can be transported without any great difficulty.

The most important cotton textile producing countries of the world are Great Britain, U.S.A., Japan, Germany. France and India. Recently the cotton textile industry of the U.S.S.R. has also made a great progress.

Great Britain. The cotton textile industry in Great Britain was developed in the 18th century and in course of a few decades, it began to dominate the world. Cotton has been called *bread* in the U.K. but the cotton textile industry does not now dominate the world as it had done once. The factors which helped the establishment of cotton textile industry in Great Britain in the later part of the 18th century were extensive Empire and tremendous power which Britain enjoyed so that it had then under its control, sources of raw material as well as the centres of consumption. Then at that time, the cotton producing areas of the world had not come to establish their cotton textile industry. The humid climate, nearness to the sea and extensive deposits of coal were found most favourable to the localisation of this industry.

As a result of these factors, cotton textile industry came to be established in *Lancashire* and still 85% of this industry is concentrated there.

Great Britain does not grow any cotton and therefore, it has to import raw material from the U.S.A., India, Peru, Egypt, Sweden, Brazil and East Africa. But the industry in U.K is highly specialised and we find that the industry specialises even in spinning, weaving and doubling. *Southern Lancashire* is the spinning and doubling region. *Oldham* spins coarse and medium counts, while *Bolton* and *Mancheshter* spin a fine quality. The *Northern and Eastern part of Lancashire* is the weaving region. *Preston, Blackburn, Burnley* are the most important weaving centres. About 70% of the raw cotton comes from the U.S.A. Egypt is the next source. But recently, there has been a tendency for these imports to decline because of the increase in consumption both in the U.S.A. and Egypt. British cotton industry, therefore, is giving its attention to the raw cotton of East Africa.

British cotton textile industry depends on foreign markets. After the first world war, its markets and imports abroad have been gradually sinking and that has brought about crisis in the Lancashire cotton textile industry. The competition from Japan and India has also given it a set-back. But British cotton industry has continued to specialize in the production of fine products but is no longer an expanding industry. Having been reduced to the 5th rank among the producers of cotton fabrics, U.K. has now

to think of improvement and consolidation by research and better utilisation of labour. Australia, South Africa and West Africa are the only markets left for British goods.

U.S.A. The Cotton Textile Industry in the United States came to be established because of the accumulation of capital and the extensive local market. Several businessmen of New England who had accumulated vast amount of money in foreign trade and commerce, established cotton mills and gradually the textile industry of the U.S.A. came to shape. Now the U.S.A. is the largest manufacturer of cotton goods in the world. The three most important regions of cotton manufacture are :—

- (1) North-eastern U.S.A or New England States.
- (2) Central Atlantic States.
- (3) Southern States of Alabama, Georgia and Carolina.

New England. New England region came to develop the cotton textile mill industry because of humid climate, facility of water power, nearness to cheap coal and the accessibility to the interior markets of the country. The presence of water power determined the localization of the mills at the earlier stage. The manufactures are characterised by finer quality production and greater finish. Still a large quantity of cloth comes from other manufacturing centres of the U.S.A. for finishing, dyeing and printing. Now-a-days the cotton mill industry here is on the decline because the southern States which also grow their own material have stolen a march over the New England region.

Central Atlantic States—Central Atlantic States which manufacture cotton textile goods are Pennsylvania, New York, Maryland, Philadelphia being the main centre. Labour supply, existence of machine shops and the presence of market facilities have been the chief reasons for the localization of industry here. The mills of this area specialize in knitted goods and this is the chief seat of U.S. hosiery industry.

Southern States. Cotton industry has increased tremendously within recent years in the Southern States or North Carolina, South Carolina and Georgia. This region has the following advantages which are not found elsewhere :—

(a) Proximity to the raw material. This area produces raw cotton and, therefore, so much cost is saved over transport and packing.

(b) Water power has recently been developed here with the coming up of the Tennessee Valley Authority. Coal is also found and, therefore, there is abundance of industrial power.

(c) The States of the south have cheap white labour who are mostly descendants of the early settlers from Scotland and

Ireland. The manufacture of the South is mostly of the coarser type in which lot of raw material is consumed but skilled labour is not needed.

(d) The greatest advantage, however, is that the textile mills of the south have a very low operating cost. Because of this, American industrialists are now transferring their capital from the north to the south and in recent years, the Southern States have become more important for cotton manufacture than the earlier and older New England States.

As against these facilities, the chief deficiency is that the water found in this region is not suitable for finishing and, therefore, for better finish, the manufactured goods have to be sent to the north but now water is taken out from wells and facilities for filtering it are also available.

The U.S. Cotton Textile Industry is highly specialised and comprises of the following four types of mills :—

Spinning—spinning and fabric weaving—broad fabric weaving—spinning, weaving and finishing—finishing.

The U.S. Cotton Fabrics have an extensive export market in Canada, Philippines, Indonesia, South Africa, Venezuela, Iran, Thailand, Ceylon and Malayasia.

Japan—Cotton is known as *power* in Japan and this industry has made Japanese people occupy a more important position in the countries of the world. The first cotton mill in Japan was established in 1862 and for 15 years, there was no great development. But thereafter, a large number of mills began to be opened round Osaka. The main factors which helped the establishment of this industry in Japan are the following :—

(1) Suitable humid climate, (2) Cheap hydro-electricity, (3) Cheap means of transport, (4) Nearness to vast consuming markets of India and China, (5) Cheap labour, (6) Rational management in the factories, and (7) Rational utilization of the imported raw material.

As a matter of fact, the Japanese cotton textile industry enjoys certain facilities which are not available elsewhere.

(1) The labour force in the textile mills consists of women whose wages are much lower than those paid to the textile workers in the other countries.

(2) Besides being cheap, the Japanese labour is quite efficient, and one operative can handle as many as 400 to 600 spindles.

(3) The introduction of automatic looms has further added to this advantage and one weaver can look after 30 to 50 looms.

(4) Then, the machines are better utilized here and most of the mills work in two shifts.

(5) The management is also rational both in having less supervisory staff and secondly in utilizing cotton waste and useless yarn. As a result of this, the cotton textile goods of Japan are much cheaper in the international market.

Japan does not grow any cotton and it has to import raw materials from India, U.S.A. and Egypt. Like Great Britain, this industry depends on foreign markets. The main centres of cotton textile industry in Japan are Osaka, which is known as Manchester of Japan, Nagoya and Tokyo.

The development of cotton textile industry in Japan is a story of very fast development. Before the Second World War, the number of spindles had increased to 130 lakhs while the number was only 25 lakhs in 1912. But after the Second World War, the cotton textile industry suffered a lot and the number remained only 27,80,000. Japan has since developed its cotton textile industry again to the pre-war level.

Japanese cotton textile fabrics have the peculiar advantage of being low priced and of good quality. The industry is export oriented and besides the Asian and African markets, its printed and dyed fabrics have a great demand in U.S.A., U.K., West Germany, Australia and Latin America. Its annual export has crossed 1 million cubic metres and Japan is the fourth biggest producer of cotton goods, the first three being U.S.A., the U.S. S.R. and India.

India—Apart from performing the vital function of clothing the bulk of the Indian population and of earning valuable foreign exchange through exports, the cotton mill industry is the mainstay of many enterprises. It needs a large number of goods to enable it to produce cloth and yarn.

The cotton textile industry prides itself to be the third largest export earner and also India's number one industry. The textile industry is not only the oldest but one of the most important in the country in terms of the capital employed, of the number of workers employed and in terms of gross national product. It has a crucial role to play in the national economy of the country.

The cotton textile industry of India is the largest single mechanised and organized industry in India. Although making of cotton fabrics is a very ancient industry in India and Dacca Muslin was in great demand in the Courts of the Roman Empire, its beginning on modern organized factory lines started in 1851, when the first Indian cotton mill was started in Bombay. The following factors helped the growth and development of cotton mill industry in India.

(a) Traditionally skilled workmen; (b) Extensive cotton production (c) Vast internal market; (d) Spirit of nationalism; and Swadeshi movement to boycott foreign cloth; (e) Abundance of coal and water power; (f) Cheap labour; and (g) Fiscal protection in 1927.

The main areas of production are :—

(a) *Maharashtra—Gujarat* in West India : Bombay, Sholapur, Poona, Jalgaon, Nagpur and Ahmedabad.

(b) Coimbatore—Madurai—Salem in *South India*.

(b) Indore—Gwalior—Kanpur in *Central India*.

(d) Hooghly Basin of West Bengal in *East India*.

(e) Delhi—Modinagar—Phagwara—Bhiwani in *North India*.

18 per cent of the production is exported ; 70 per cent of the export is medium varieties; India is the second largest exporter of cotton goods ; main markets are Sudan, Ethiopia, Nigeria, Kenya, Tanzania, Ceylon, Burma, Afghanistan, U.K., Saudi Arabia and Indonesia. But the industry suffers from the following problems :—

(1) 10% shortage of long staple cotton and dependence on supplies from U.A.R., Sudan, U.S.A. and Pakistan.

(2) Lack of competitiveness both in price and quality.

(3) Lack of automation and so a large number of uneconomic units.

(4) Poor transport facilities.

(5) Not always encouraging tariff policy.

3. SILK INDUSTRY

Silk is produced both by natural insects, known as silk-worms and by artificial means. The latter is known as rayon and is fast eroding the market of natural silk. Besides India, Japan is the only country which has a very flourishing silk industry of both the types. Synthetic fibers have been steadily eroding the markets held by even cotton and wool.

Artificial Silk

Various development have led to this situation. Nylon, and the acrylics and polyesters, three of the basic categories of synthetic fibre, came down sharply in price last year, making them more attractive in relation to cotton, wool and the other important man-made fibre, rayon, cotton and wool suffered another blow as a result of devaluation ; prices of the man-made fibres went up by between 1 and 5 per cent, depending upon the imported raw materials whereas the natural fibres felt the full blow of devaluation.

The current world man-made fibre producing capacity (including textile glass fibre) is as given below :

	1967	1968	(million lbs.) Percentage increase
Whole world	15,289	17,942	17%
Rayon and acetate only	8,506	8,790	3%
Non cellulosic man-made fibres	6,304	8,574	36%
Textile glass fibre	471	578	23%

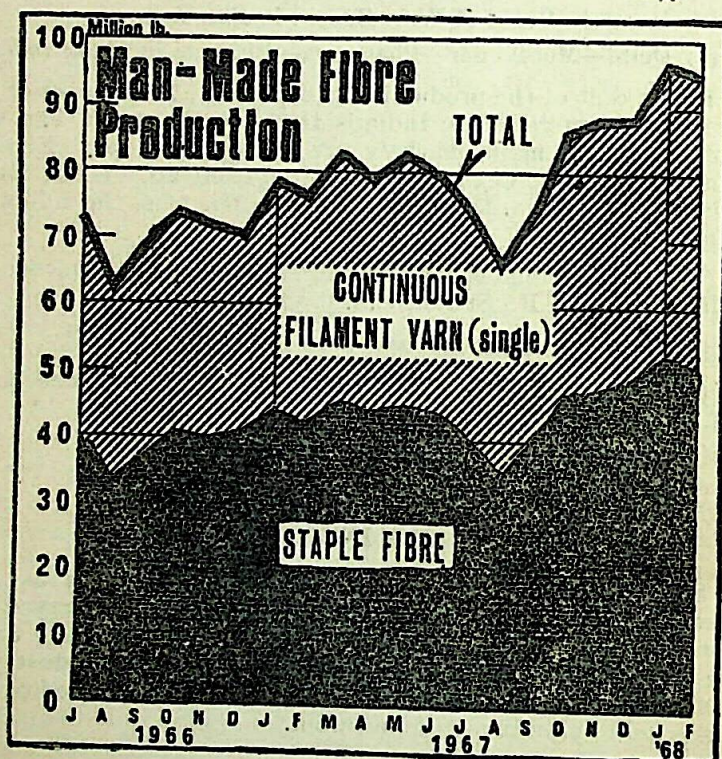


Fig. 38

U.S.A., Japan and West Germany are the major producers in the world. U.K., East Germany, U.S.S.R. and India come next in importance.

Natural Silk

There are three distinct areas where silk industry has been developed. They are :—

- (i) *Central-western Europe* comprising Italy, France, Germany and Switzerland, which manufactures 1/3 of the world's silk.

(ii) *North America*—U.S.A., which depends on 90% imported raw material.

(iii) *Asia*—Japan, India and China.

Lyons Area of France ; Milan, Como and Bergamo in the Po-valley and the Alpine valley of Italy have developed silk manufacture because of raw silk production in nearby farms, cheap hydro-electric power and the presence of skilled female labour. Some raw silk is also imported from Japan and China.

Peterson in New Jersey (U.S.A.) and Eastern Pennsylvania are the centres of silk manufacture from totally imported raw material. Hosiery and knitted wear are a speciality. But now rayon manufacture has thrown this industry into the background.

India produces silk in the following three areas :—

(a) Southern Portion of Mysore Plateau.

(b) West Bengal—Murshidabad, Malda and Birbhum districts.

(c) Jammu and Kashmir.

Besides these areas of mulberry silk production, the following are the regions of non-mulberry silk production in India :—

(i) *Tassar* silk—Bihar, Orissa and Madhya Pradesh.

(ii) *Endi* silk—Assam.

(iii) *Muga* silk—Assam.

Most of the silk mills are on cottage industry basis and only a few have powerlooms. Indian silk goods are known for their artistic finish and superior quality. Its market is Ceylon, Singapore, Hong Kong, Malaysia and East Africa besides the U.S.A. and other countries of the West. About one million metres are exported every year.

4. WOOLLEN TEXTILE INDUSTRY

Wool, obtained from sheep, is spun and woven into cloth and it forms a very important industry in the temperate regions of the world, where woollen fabrics are required to protect man from cold. 80% of the wool comes from the three southern continents of Australia, South Africa and South America. The manufacture of woollen fabrics is concentrated in the advanced countries. The percentage share in the production and consumption of woollen fabrics is given below :

	Production	Consumption
Developed countries	60%	60%
Developing countries	20%	10%
Eastern Europe and Asia	20%	30%

The main countries producing woollen yarn and woven fabrics are the U.S.S.R., Japan, U.K., U.S.A. France, Italy and West Germany. Till 1959 U.K. held the first place in world production and next came the U.S.S.R. and the U.S.A. But in recent years Japan's production of woollen fabrics has been increasing. Now U.S.S.R., and Japan have become first and second in world production, while the U.K. has been relegated to the third position.

U.K. the oldest woollen fabric manufacturer has its woollen industry centralised in Yorkshire and its products are reputed for their high quality and finish.

U.S.A. also developed its woollen fabric manufacture as far back as 1812 and New England States were the principal centre but due to competition with imported woollen fabrics and the growing demand in the home market for light weight nylon fabrics the industry has declined very much.

Now *U.S.S.R.* and *Japan* have stolen a march and their production is continually on the increase.

5. CHEMICAL INDUSTRY

Importance—The chemical industry is regarded as a key industry to the economic life of a country. The most important feature which characterises the chemical industries from other countries is the factor that the former tear down and rebuild basic substances whereas the latter change the size, shape, patterns and texture of raw materials without disturbing the molecular arrangements of the substances. For example, the chemical industries change petroleum into rubber, coal and air into artificial silk, coal tar into dyestuffs, medicines or food flavouring. In the advanced countries of the world, chemical industries occupy the foremost position among the national industries.

The first step in the development of chemical industry was taken in 1749 when sulphuric acid was made in England. The industries first developed in England, then in Germany and other European countries and the U.S.A. The present is an era of chemical discovery. Research chemist and chemical engineer have played a great part in building up chemical industries. Chemical research has become an essential component of modern industries.

Chemical industries yield a large number of products, such as industrial or heavy chemicals, soil fertilizers, explosive, dyestuffs, colours, plastics drugs, medicines, fine laboratory chemicals, soaps, essential oils, perfumes, tanning material, certain foods, biologicals, rayon-nylon, cosmetics, paints, synthetic rubber and other chemical substances used in manufacturing process.

The raw materials used in the industries are as varied as the industries themselves. Some of the substances are derived from

organic matter. For instance, the cellulose, hydrocarbons, carbohydrates, nitrates, bones etc. are obtained from plants and animals. Nitrogen gas is obtained from the air; bromine iodine, sodium salts and potassium, from the earth.

Classes of Production—For use in industrial production, chemicals can be grouped under two headings: (1) **heavy chemicals** and (2) **fine chemicals**. The heavy chemicals are produced in enormous quantities and at a low cost and are consumed almost in manufacturing and agricultural operations. The term heavy chemicals is applied to substances, such as, the common acids, alkalies, fertilizers, etc. They are mainly used for processing the raw materials of other industries such as, textiles, paper, soap, glass, leather, kerosene, motor spirit, lubricating oils, etc. On the other hand fine chemicals are manufactured in relatively small quantities. Their production requires great skill and care in early operation. Under this group are included photographic materials, drugs and pharmaceutical products, paints, varnishes, pigments, dye-stuffs, etc.

Heavy chemicals consist chiefly of sulphuric acid, soda ash, caustic soda, chlorine and ammonia. Plants making heavy chemicals tend to locate near raw materials. The total consumption of sulphuric acid in a country is one of the barometers of industrial activity. Sulphuric acid is the most important substance of the Chemical Industries. Every industry uses some sulphuric acid, which is made from pyrites (Iron Sulphate) and from native sulphur. The world utilization of sulphuric acid is given below :

Fertilizer manufacture	25%
Petroleum Refining	20%
Chemical making	20%
Other Industries.	35%

Soda ash is the leading industrial alkali and is quite as important as sulphuric acid. It is made from common salt and limestone. Soda ash is mainly used in the making of chemicals, soap, glass and paper. It is also used in refining petroleum.

Chlorine is used in bleaching textiles, in the manufacture of explosives and dyes, as a disinfectant and a water purifier.

Caustic soda is made from salt. It is used in the making of soap, paper and is also used in petroleum refining and chemical production.

Ammonia Sulphate, Urea, Ammonia nitrate, and super phosphate are the main chemical fertilizers which contribute to the raising of a country's farm production and they are the products of the heavy chemical industry.

Fine chemicals cover a wide range of synthetic products. They have very precise standards of purity and efficacy. All chemicals, therefore, can be grouped into fine chemicals depending on the standards of purity, nature of use and complications in the process of manufacture. Fine chemicals include *synthetic drugs, analytical reagents, photographic chemicals, disinfectants, germicides etc.*, in all of which exact specifications of the products are required to be maintained. Amongst these, synthetic drugs form the major group of chemicals.

The remarkable industrial progress, of Europe, America and Japan after the second World War has been very substantially based on the development of the organic chemical industry, which has a very diversified end-product pattern. The basic raw materials are derived mainly from three sources—(a) alcohol (b) coal carbonisation (c) petroleum naphtha or refinery gases.

Petro-chemicals in the wider perspective include the entire field of synthetic organic products like plastics, synthetic rubber, detergents, fibre chemicals, solvents and some of the other basic organic chemicals. Together, they represent the world's fastest growing industrial sector. Although comparatively new, plastics are already one of the world's main group of industrial materials. In terms of volume, the world's plastics consumption is now greater than that of all non-ferrous metals combined, although still less than a quarter of world's steel consumption.

The petro-chemical industry has made phenomenal progress in the Western countries. Significant technological and other developments, which are having far reaching consequence in the field of petro-chemical industry, have taken place in recent years and further developments are in progress at the present time. As a consequence of these rapid changes, new products are being put in the market, and while some of them are supplementing some of the conventional older products, others are getting into use.

A sound integrated petro-chemical industry makes available plastics, fibres, rubbers, detergents and other materials like the fertilizers and insecticides, plant nutrients and food supplements, cosmetics and medicines.

Prospects and Problems—The chemical industries constitute a very large area of industrial activity and have some special features of their own. It is true that the chemical industry as a whole is capital intensive, has long gestation period and the ultimate products are more consumer market oriented and as such its contribution to the rate of the growth of the national income is comparatively low than that of other industries like iron and steel and machine building, etc. But its importance as a vital key industry in a developing nation like ours, can hardly be disputed.

The use of chemical products are so diversified that a close integration between the production of chemicals and the ultimate

distribution in consumer products after a series of intermediate industrial uses, interdependent sectors have to be very carefully assessed and time scheduled before formulating any production plan. The programme conceived by us must be coherent leading to a co-ordinated and accelerated growth in future years with increasing value of output in relation to our trade gaps in respect of chemical industries.

Capital costs for setting up plants are exceptionally high and the operations demand a large proportion of scientifically trained personnel. The industry, moreover, undergoes rapid technological changes because of the introduction of new processes and products. Accordingly, to achieve economic operation, there has to be a high rate of capacity utilisation and very careful assessment of the economics of scale. Market size is essential to achieve economic production levels.

Development of petrochemical industries should not be in isolation but within the framework of the broader economic and industrial development of a country. The setting up of large units to reduce costs make the situation all the more difficult for developing countries with small markets. Availability of raw materials and access to markets are the determining factors in locating petrochemical industries. Establishing a plant near a refinery in order to use refinery products may cause difficulty in disposing of petrochemical products.

6. PLASTICS

Plastic entered the industrial world in 1909 when Leo Hendrik Baekland made possible the manufacture of phenolic resins synthetically. Since then, due to the breath-taking discoveries in chemical technology the plastics industry has assumed world stature in as much as it has now become a major industry in every industrially advanced country. Plastics can be extruded; injection moulded; blow-moulded, fabricated and vacuum formed, etc.

Table XIV : 2—Plastics : Average World Production and Consumption

<i>Country</i>	<i>Production ('000 tonnes)</i>	<i>Per Capita Consumption (Kilograms)</i>
West Germany	2200	29.8
Italy	930	9.8
France	780	14.4
Netherlands	285	N.A.
Belgium/Luxembourg	120	N.A.
U.K.	1035	15.7
U.S.S.R.	940	3.6
U.S.A.	5900	24.7
Japan	2100	13.8
Canada	270	N.A.
East Germany	245	N.A.

In some respects, it is even challenging the privileged domains of iron and steel and other metallic industries. To-day it is recognised as the most versatile product which serves modern man and his civilisation in various ways. It is a fast growing tooling and gadgerty material in various branches of engineering, in building and construction, in agriculture, in automobiles, in aeroplanes; in space technology and above all, in the sphere of domestic world it serves to fulfil the intimate and sophisticated needs of modern men and women through the medium of radio, television and other items of ease, comfort and glitter.

Future Prospects—Injection moulding process today holds a very important place in the plastics world and it is the principal method of forming thermoplastics materials. Invariably, a finished product is obtained from the raw materials in a single step in almost any desired shape and colour.

Therefore, injection moulded articles require either no subsequent machining or very little of it. Anybody from outside the injection moulding field who sees an injection moulding machine in action at a trade fair or elsewhere is immediately impressed by this remarkably effective and "simple" processing method.

With modern machines and precision moulds that are designed and manufactured by specialists, it is possible to run the machines on fully automatic cycles. Because of this, injection moulding has become one of the most versatile processes for the economic mass production of all sorts of articles. The shapes can be as simple as a tumbler or a plate and as complicated as a camera body where close tolerances are very essential.

The discovery of many new plastics and the improvement of the existing ones have worked as a big incentive for the injection moulding process. As a result of this, it has been possible to embrace more and more fields of applications. Whichever phase of life we consider, injection moulded articles play a major role. For developing countries the following applications are of immediate interest :—

Household articles like cups, plates, tumblers, spoons, bowls, buckets, baskets, trays, mugs, egg-cups, tubs, containers for storing foodstuffs, soap boxes, etc.

7. ENGINEERING INDUSTRIES

The development of Iron and Steel Industry has given rise to several ancillary and subsidiary industries, the most important among them being the electrical and mechanical engineering industries, shipbuilding, bicycle manufacture etc.

Engineering industry is the base and vital industry without which no other industry can be established. The engineering industry is highly diversified and covers an extremely wide range. The more the other industries advance, the advancement of the

engineering industry will be correspondingly more. The industrial progress of a country is gauged by the advancement and development of more engineering industries.

The Engineering Industry provides enormous prospects for increasing investments and employment potential in the country.

Machine Tool Industry

The *machine tool industry* is a vital engineering industry and the development of other industries depends to a great extent on the growth of this industry. Machine tools are used for cutting, shearing or pressing metals into desired forms.

Lathes, milling machines, drilling machines, shapers and gear cutting machines are all described as machine tools. They enable the production of inter-changeable components with precise dimensions and thereby facilitate mass production and assembly of modern industrial equipment; in particular, quick and inexpensive replacement of worn out parts.

It has been estimated that in many industrial establishments, nearly 70 to 75 per cent of the plant and equipment consists of machine tools, jigs, fixtures etc.

Development and expansion of many industries notably those engaged in mass production need in a growing measure turned components in millions, machined out from ferrous and non-ferrous metals as well as out of synthetic materials like bakelite and nylon. These components must be of consistent accuracy to ensure interchangeability.

Essential factors of Localisation are (a) Presence of raw materials dependent on Iron and Steel Industry (b) good transportation facilities, (c) highly skilled labour, (d) provision for Industrial Research.

Main Areas of Production are U.S.A, West Germany, U.K., France, Switzerland, Italy. Czechoslovakia, Austria and Japan are the other major areas of production.

U.S.A. : Chicago, Milwaukee, Detroit, Pittsburg, Buffalo, New York (Export position weak).

U.K. : Midland, Yorkshire, Lancashire, London and Glasgow (Oldest and marked by a high degree of specialisation).

West Germany : Cologne, Essen, Dusseldorf, Frankfurt, Stuttgart, Berlin.

U.S.S.R. : Kharkov, Kiev, Dnepopetrovsk in the Ukraine, Sverdlovsk and Nizhni in Urals ; Moscow and Leningrad.

Shipbuilding Industry

Shipbuilding is a branch of Iron and Steel Industry. It is essentially an assembling Industry. It buys materials such as,

boilers, engines, electrical machinery, furniture and fittings and assembles them in the form of ships, the basic materials used being iron and steel and heavy machinery.

The quality of a ship—whether steam or diesel propelled—depends upon its buoyancy, stability, capacity and speed in the water and all this requires :

- (a) high technical skill
- (b) right kind of structural materials,
- (c) correct designs for the principal dimensions of length, beam and breadth, hull form and general arrangement of the ship,
- (d) tidal estuaries near the plants for testing and launching of ships,
- (e) large space for construction work.

Therefore, the following factors are essential for the successful development of shipbuilding industry :

- (a) Low cost iron and steel production adjacent to the sea.
- (b) Cheap skilled labour.
- (c) Adequate supply of capital.
- (d) Presence of good harbours.
- (e) A large market.
- (f) Ample supply of aluminium and timber at cheap cost.

The shipbuilding industry is mainly concerned with the making of steamers and tankers. The principal shipbuilding nations are : Japan, West Germany, Sweden, U.K., Netherlands, Poland, Norway, France, Italy and U.S.A.

Japan leads the world in shipbuilding, accounting for over half the total global output with concentration mainly on big tankers and bulk carriers, and it has been holding this first rank now for the last 11 years in succession.

Among the largest shipbuilders, however, Japan fell behind Sweden in the percentage of vessels launched for export—60 per cent against Sweden's 68 per cent ; West Germany's 49 per cent and the United Kingdom's 28 per cent.

The main advantages enjoyed by the Japanese Shipbuilding Industry are given below :

- (a) World's biggest yards.
- (b) Cheap labour and economy in the acquisition and use of raw materials.
- (c) A series of excellent ports and harbours.
- (d) Mild climate keeps the estuaries open throughout the year.
- (e) Large demand from shipping lines.
- (f) Govt. assistance.

Now with the devaluation of the British currency in 1967, Japanese shipbuilding industry has been put at a disadvantage and Japan will have to work hard to bring back the old difference in price.

Tokyo, Yokohama, Kobe, Nagasaki, Tamano, Kure and Maizuru are the chief centres.

West Germany occupies the third position in shipbuilding and this has been possible due to the following factors :

(a) A number of tidal estuaries, (b) a very flourishing Iron and Steel Industry, (c) highly trained technical labour (d) expanding trade (e) extensive facilities for technical training.

50% of the vessels made are tankers and the chief centres are Hamburg, Bremen, Kiel, Bremerhaven, Lubeck, Emden.

Britain was the leading shipbuilding country before the Second World War but now it has been reduced to the third rank after Japan and Sweden. It is the oldest shipbuilding country and became a pioneer in this field due to certain basic advantages :

(a) Extensive Empire and large scale maritime trade.

(b) Early start in the manufacture of machine tools.

(c) Deep tidal estuaries.

(d) Abundance of coal.

(e) A very flourishing steel industry.

(f) Demand for merchant ships and fishing boats.

Even though thrown into the background, ships made in Britain still have the reputation of quality. But the prices of British ships are high and the delivery dates are late in comparison with other shipbuilding yards of the world.

Other important centres

Sweden : Gotebord, Malmo.

France : Bordeaux, Brest, Cherbourg, Havre, Marseilles, Nantes, Rouen and Toulon.

U.S.S.R. : Leningard, Riga, Sebastopol, Odessa. Vladivostok.

Automobile Industry

Automobile industry is one of the basic industries. In times of emergency its manufacturing plant can be used for manufacturing essential war equipment. Automobile industry is not a single industry for the automobile is an assembly product. As many as 5,000 factories may supply parts for a single automobile. Automobile is a web of industries disseminated over the entire country ; for example, Detroit motor car is the outcome of 1,050 factories owned by about 850 companies.

The following are the chief factors that favour the establishment of an automobile industry :

- (a) Abundant supplies of heavy metal, wood, glass and fuel.
- (b) Cheap and efficient transportation.
- (c) Skilled labour.
- (d) Large home market.
- (e) High degree of scientific and engineering skills.
- (f) Huge capital investment.
- (g) Efficient plant layout.

The main centres of production are :

U.S.A. : Lower lake area (Detroit) ; Flint, Lansing, Pontiac, Kenosha and Toledo.

U.K. : Midland Region (Birmingham, Coventry), London.

France : Billancourt, Flins, Poissy.

West Germany : Wolfsburg near Hanover (Volkswagen) ; Stuttgart (Mercedes Benz) ; Frankfurt ; Cologne, Kassel.

Italy : Turin.

These five countries account for 80% of the world production, U.S.A. alone being responsible for 50% of the world production. U.S.A. produces largely for the home market ; while France, the one time second leading producer and the U.K. (the one time third largest producer), where the industry has increased tremendously since 1948, cater to their export markets in U.S.A., Canada, South Africa and Australia.

In recent years *Japan* (Tokyo and Yakohama) and the *Soviet Union* (Gorki and Moscow) have been coming up very well in this field. It is estimated that by 1971, *Japan* may be producing 5 million vehicles a year, of which 50% may be passenger cars. The basic reason for this leap is the quality of the Japanese motor industry's salesmanship. Overall forward planning by the industry envisages that by 1971, 20% of Japanese car production may go abroad as against 17% today. The rising output of Japan's automobile production lines has been the fastest among the world's leading auto-manufacturing countries.

CHAPTER XVI

Transport

Production of a commodity is not complete, unless it reaches the hands of the consumers. Wheat with the farmer and the cloth in a cotton mill have to be transported to the places where they are needed. Transportation, therefore, is part of production and a commodity which is being transported is actually in the process of production.

In a primitive society, man produced for his own subsistence. There was no need for a market and, therefore no need for any means of transport to take the produce to the market. But modern production is for the market and it is this need for the market which has led to the rapid expansion of transportation. Inadequate transport facilities will hinder and slow down supply of raw materials to factories or finished goods to shops and are likely to push up the transport costs. The cost of transport is a very important consideration for every producer and seller and it is dependent upon such factors as the distance the goods have to be transported, the speed at which the transport is undertaken, the care and attention devoted to packing, loading and checking and the means of transport adopted.

Cheapness in transport can be achieved by uninterrupted carriage over long distances, increase in the size of the carrying agent, using direct routes and having full cargoes in both directions. The cost of transport will depend upon the time factor. When perishable commodities like fish, fresh fruits and flowers have to be transported to the market, the fastest modes of transportation are chosen. The latter may appear to be quite expensive but in fact they are cheaper since perishable goods lose their value quickly once they begin to deteriorate. If time is of no importance as in the case of non-perishable commodities like coal, more leisurely modes of transport may be adopted. Further, the cost of transport will also depend upon the size of the load and the nature of the load. Generally, speaking the larger the load to be carried, the less is the cost and this fact explains the popularity of bulk carrying. In these days, huge oil tankers and other bulk carriers have been developed. Again, many non-perishable commodities like ores and coal can be carried in open trucks or barges.

But fragile goods like glass and chinaware and perishable commodities like flowers and fruits have to be carefully packed and loaded. The amount of packing needed and the care required to prevent waste and loss in transportation will necessarily increase the cost of carriage.

1. PROGRESS IN TRANSPORTATION

The relative importance of the various modes of transportation differs greatly. The old and more elementary forms of transportation, such as human porter, pack animal, cart or wagon are of no significance in advanced countries but they are very important in countries like India. They supplement the modern facilities of transportation. The great carriers of freight are railways, ocean vessels, motor trucks, barges and boats on inland lakes, rivers and canals and pipelines. Estimates indicate that railways account for about 40 per cent of the freight ton mileage, ocean vessels account for 33 per cent and the others account for the freight mileage.

Tremendous progress has been made in all modes of transportation since World War II and the world is now poised for a new revolution in transport technology. In the first place, railways have made significant changes in recent years and more are certain to come. In many parts of the world, the use of high-speed diesel engines, newly designed cars, and better rail construction are making possible faster service and making railways more competitive, specially for long distance hauls. The recently introduced container service is also becoming very popular as it affords greater security and saving in time and costs. Refrigerator container units are being used for the transport of meat, dairy products, etc.

Secondly, transportation by motor vehicles has increased with by improvement in designs, durability and performance of vehicles and by the increased efficiency of petrol, diesel and other new sources of power. Aircraft, with vertical takeoff and vertical landing is among the new innovation in air transport and it may become very economical for relatively short distances. Air transportation is also becoming important for the movement of perishable commodities.

Thirdly, there is a possibility of a revolution in water transport also. Diesel-powered tow boats and barges can move large tonnage of bulky commodities at a very low cost. New types of ships, tow boats and barges, increased mechanisation of loading and unloading and the use of electronic navigational aids can expand greatly the importance of low cost water transportation in the development of many countries.

Finally, pipelines have demonstrated the economy of the movement of oil, coal, chemicals and other liquids and solids. Any

material that can be broken, crushed into fine material, suspended in a liquid and restored to a suitable condition for use can now be moved in large quantity by pipeline. It is expected that in the future several materials may be pumped from one part of the country to another, from one country to another, whenever the traffic is sufficiently large and where low cost water transportation is not available.

2. TRANSPORT AND ECONOMIC DEVELOPMENT

For the prosperity of a country, agriculture, mining and industry are very important. But equally important is the system of transport and communication which makes trade possible. If agriculture and industry are regarded as the body and bones of the economy, transportation and communication constitute its nerves. A modern economy cannot exist without an efficient system of transport.

The transport system helps to broaden the market for goods and by doing so, it makes possible large-scale production through division of labour. It is a necessary condition, therefore, that the transport system should be well-developed so that agriculture, industry, mining, etc., may be fully developed. Transport system is also essential for the movement of raw materials, fuel, machinery, etc., to the place of production. The more extensive and continuous the production in any branch of activity, the greater will be the need for transport facilities. It may be observed here that transport facilities are required by agriculture normally to market its products, but in the case of manufacturing industries they are required for production as well as for marketing.

From the point of view of a backward but developing country like India, there is another and more important effect from transportation and communication. In rural India, people are steeped in ignorance, superstition, caste prejudices, false customs and traditions. These are responsible for hindering labour from moving from one occupation to another and, in general, for preventing rapid economic progress. But the development of transport and communication supplies new ideas and helps in the diffusion of knowledge. They help to break up caste restrictions and other barriers to rapid economic progress.

Transport development helps to open up remote regions and resources for production. Regions may have abundant agricultural forest and mineral resources but they may not be developed if they continue to be remote and inaccessible. By linking the backward regions with the relatively more advanced, transport development helps in the better and fuller utilisation of resources.

Finally, expansion of transport helps in industrialisation directly, and also helps to raise national income. The demand for locomotives, motor vehicles, ships, etc., leads to the starting of industries which specialise in the production of these goods.

Besides, transport development stimulates such large and heavy industries as iron and steel, engineering, coal, etc. Expansion of transport and communication is, thus, of fundamental importance for a developing country like India which is on the road to rapid industrial progress.

3. CHIEF TRADE CARRIERS

Efficient and quick means of carrying persons and goods from one place to another is the most important factor in the advancement of civilization and is the life blood of commerce. Flourishing trade involving exchange of commodities calls for an efficient means of transport, which in its turn brings together different parts of the world.

Transport is of many kinds. According to the importance in trade, the following are the varieties of transport in use in the world today.

(a) **Sea and Water Transport** by ocean going vessels, boats and steamers.

(b) **Land Transport** through trains, lorries, trucks, beasts of burden or by other mechanical devices.

(c) **Air Transport** by means of aeroplanes or airwagons.

In the past and in the economically backward areas today, man or beasts of burden were and are the means of transport. In Central Africa, China and India, men are still employed to carry loads for short distances. At many places the relief and climate make it necessary for hire porters to be employed to carry the produce of the region from one place to another. Horse in temperate lands, camels in hot deserts and elephants in wet tropical areas serve as very valuable means of transport. In hilly terrains, mules and yaks are used for transportation. In cold arctic regions dogs and reindeer work as means of transport. These beasts of burden are often made to draw wheeled carts over roads.

Increasing world population, production and trade have brought about a similar pattern of expansion in transport activities. More passengers and goods are being moved by air and by sea, by rail and by road than ever before.

The following are the factors that influence transport :

(a) cheapness (b) quickness ; (c) safety ; (d) good natural resources (e) flat and even topography ; (f) good climate.

The *sea and water transport* requires for its success the following four other factors, besides the six named above :

(i) Freedom of the highway.

(ii) Freedom of the terminals.

- (iii) Easy access to the sea.
- (iv) Presence of good harbours.

Ocean Transport—Ocean transport is at present the prop of international trade. Most of the international trade of the present times is routed over the oceans. Ocean routes connect different lands and promote foreign trade. Ocean transport is cheaper than land transport and the sea or ocean routes can be used all the time.

On the land, roads have to be built or the railway track has to be laid. This means initial capital outlay. And then the roads and railway tracks have to be perpetually maintained, which means a recurring expenditure. There is no such outlay or expenditure on ocean routes. Ships hold much greater cargo than either trains or trucks can carry. The cost of working is less than the different forms of overland transport. The tonnage carried is much more than the tonnage of the carrier. This is the only means of transport across oceans and between the different continents, the other means *i.e.*, Air transport is both very expensive and very much limited in carrying capacity.

The ships moving on the oceans of the world are *liners* and *tramps*. Liners follow a regular route, while the tramps take the line where the greatest amount of cargo is available. The concentration of traffic along well defined lanes is due to certain factors.

In connecting commercial regions, ocean routes follow the shortest lane, which owing to the spherical shape of the earth is the arc of a great circle. Therefore, ocean routes tend to curve towards the north in the N. Hemisphere and to the south in the S. Hemisphere. But, presence of land necessitates departure from the great circle route at certain places. The construction of the ship canals can solve the difficulty.

Ships do not like to carry coal or oil for the whole voyage. Presence of coaling stations often makes ships deviate a little from the great circle route.

Even though the age of sailing ships is over, ships still want to take full advantage of the ocean currents and the prevailing winds because that means less consumption of fuel, and hence, cheap journey. Icebergs and fogs also influence the course of the ships. In order to avoid these unhealthy and dangerous conditions, ships turn to the north or south or sideways from the great circle route.

Land Transport—The value of land transport lies in inland or frontier trade. Porters are the chief means of transport in Central Africa, China, Japan and India. Camels in the deserts, elephants in marshes and ponies, mules and yaks in the mountainous tracks transport goods and passengers. But the most important means of overland transport are the roads and the railways. Roads and

railways are important only for inland or frontier trade. They are insignificant as far as international trade is concerned.

(1) Roads and railways are to be constructed at heavy capital outlay and then have to be kept in proper repair. A considerable amount of trucks and rolling stock has also to be maintained. This increases the cost of transport.

(2) There are political obstacles in the way of transport over roads and railways passing through different independent countries.

(3) No international transport is possible on the railways because their gauge is different in different countries. It varies from 4 ft. 1½ inches to 4 feet 5¾ inches.

Comparison between Inland Waterways and Railways

(1) *Speed*—The railways run faster than the inland water navigation and as such transport the goods in the shortest time.

(2) *Accessibility*—Railways can reach any place. They can do loading or unloading without breaking the bulk. This facility is not available in water transport.

(3) *Storage space*—Railways have the advantage of sidings where goods can be stored till loaded. But in the case of water transport, warehouses are very necessary quite near the ferry terminals.

(4) *Cost*—Transport by rivers and canals is definitely cheaper than it is by railways.

(5) *Factors of construction or use*—While the canal or river transport depends on climate and drainage, Rail transport depends upon topography or build of the land, although factors of climate also exercise a good deal of influence.

Comparison between Roads and Railways

(1) *Servicibility*—The motor transport carried on roads is not dependent on rail tracks. Therefore, by means of roads, goods can be transported in different directions. Road transport can thus reach the remotest village which is not possible in the case of railways.

(2) *Short distance facility*—Roads compete with the railways in short distance transport because there is no botheration of transhipment, consigning or delivery of goods as is the case in railways. Motor trucks bring the goods right into the heart of the towns, so to say, right at the door step. But for transport of heavy goods over long distances railways are still to be preferred because of their speed and reliability.

(3) *Ease of handling*—Road transport does not suffer from the bottlenecks of different gauge systems of the railways and as

such there is no question of things getting spoiled in transshipment or lying in transit.

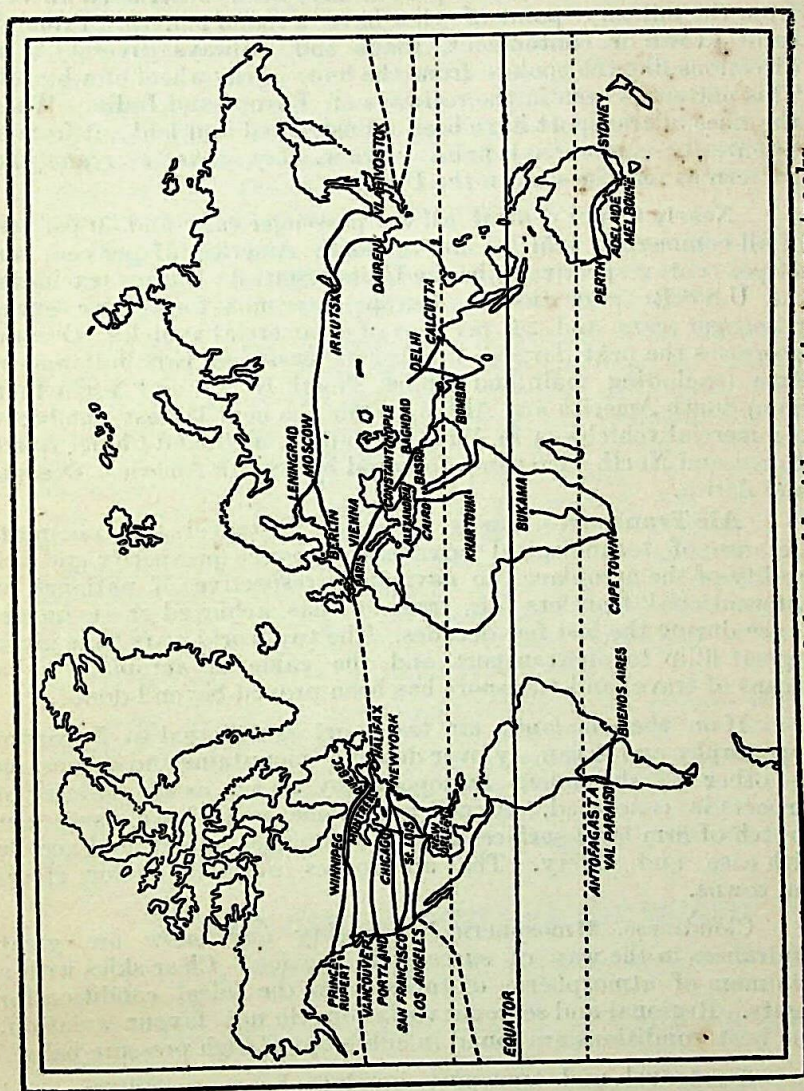


Fig. 39. Land Routes of the world with connecting 'ocean tracks.'

(4) *Elaborate paraphernalia*—Railway transport is dependent on elaborate paraphernalia like locomotives, rolling stock, rails signalling equipment, stations etc. Road transport does not require any such thing. A fleet of trucks is the only thing required. Of course, petrol pumps and servicing facilities automatically grow up in the wake of road transport.

Roads and Railways—Pattern of their arrangement—Roads and railways are built from two points of view—military or commercial. Those lines of transport as have been constructed initially from the military point of view have a *radial pattern*. From the capital town or cantonment, roads and railways diverge in all directions like the spokes from the hub of the wheel of a bicycle. This pattern is seen in the railways of Europe and India. Where the lines of transport have been constructed and laid out from an essentially commercial point of view, they take a *rectangular pattern* as may be seen in the U.S.A.

Nearly 63 per cent of all the passenger cars and 50 per cent of all commercial vehicles are in North America (57 per cent and 44 per cent, respectively, in the United States); Europe (excluding the U.S.S.R. and eastern Europe) account for 29 per cent of passenger cars and 24 per cent of commercial vehicles. Oceania possesses the next largest number of passenger cars, followed by Asia (excluding mainland China, North Korea and North Viet-nam) South America and Africa, while the next largest number of commercial vehicles is in Asia (excluding mainland China, North Korea and North Viet-nam), followed by South America, Oceania and Africa.

Air Transport—This is an age of air travel and transport. Because of technological advances, economic prosperity and the ability of the aeroplanes to navigate irrespective of national or international frontiers, air transport has achieved great importance during the last few decades. The two world wars have given a great fillip to air transport and the value of aeroplane as a means of travel and transport has been proved beyond doubt.

If on the one hand, air transport is not tied to factors of topography and it can fly over deserts, mountains and oceans, on the other it is dependent on topography so far as the building of airports is concerned. A good aerodrome must have a sufficient stretch of firm level surface so that aeroplanes might land and fly with ease and safety. The air routes normally follow rivers and towns.

Cloudiness, atmospheric invisibility and snow are great hindrances in the way of successful aviation. Clear skies with a minimum of atmospheric disturbance is the ideal condition for flights. Regional and seasonal variations do not favour aviation. The best conditions are found in sub-tropical high pressure belts.

Air travel and transport involves huge expenditure and therefore, the freight rates are sufficiently high. But the success of air freights depends upon the demand for it. Where people are too much security minded or poor or where expensive or perishable goods requiring air transport do not exist, aviation cannot be successful.

Different countries of the world have different regulations regarding foreign exchange, passport, health and customs. Ease

or facility in these determines the frequency of flights and the success of aviation.

Handling a aeroplane in the air and on the ground before it takes off, is a highly technical process. A little error or negligence might cause great disasters resulting in loss of life and property. Therefore, a very efficient technical knowhow is required for making air transport a success. Acquisition of aeroplanes and other equipment required for guiding and controlling the flights as well as the construction of aerodromes often means considerable capital outlay. Therefore, transport can only be successful in countries which are economically prosperous.

Comparison with Other Means of Transport—Air transport enjoys certain advantages over other means of transport and at the same time, it also suffers from a few disadvantages.

Aviation or air transport can be utilized both on land and water. The factors of topography do not limit air transport. Aeroplanes can fly over mountains, plateaus and plains alike. It is the most speedy means of transport. An aeroplane transports goods and passengers over thousands of miles in only a few hours; this means saving of a lot of time. The air route is always shorter than overland or ocean route. On an average, the distance of air routes is 15% less than that of the railways or roads. There is no expenditure whatsoever in making or maintaining air routes. Air travel and transport is very expensive and, therefore, it is good only for the transport of passengers, mails or precious and perishable goods. For the transport of heavy goods on cheap rates there is nothing to beat the railways and ships.

Although it has now been possible to fly several thousand miles without refuelling but for civil and commercial aviation, this possibility is very distant. If an aeroplane was to carry all the fuel that it requires for the flight, there would hardly be any space left for passengers and cargo. Therefore, like all other means of transport, it depends on a net-work of airports where it can land, fill and fly.

4. MAIN OCEAN ROUTES OF THE WORLD

- (1) North Atlantic trade route (between Eastern U.S.A. and N.W. Europe).
- (2) The Suez route (to Middle East, India, Far East and Australia).
- (3) The South American Route (between Argentina and Uruguay and Western Europe).
- (4) The Cape of Good Hope route (to Australia).

North Atlantic Trade Route

The most important is the North Atlantic Trade Route which joins the Eastern U.S.A. and N.W. Europe, both of which are

thickly populated, highly industrialized and economically the most developed. Ships including luxury liners transport cargo and passengers from the ports of England, France, Germany and Italy. New York, Philadelphia, Baltimore are important terminals on the American side. This route handles the largest amount of passenger and freight traffic in the world.

Characteristics of Trade—(1) As the countries situated at both the ends are highly industrialized, there is very little trade in manufactured goods,

(2) America sends bulky but less expensive foodstuffs and raw materials to Europe while Europe sends goods of greater worth but comparatively lesser bulk so that sometimes the ships have to return to America with less pay-load.

(3) The traffic from east to west is more than that from west to east.

(4) Earnings from passenger traffic is very much larger than that from freight traffic and again it is more from east to west. Europeans move to America to settle there.

Advantages of the route. (1) The greatest factor leading to the use of this common path is what the marines call "*the great circle line*." All the steamers sailing from New York or Boston take a curved turn towards the North and follow the root of the great circle which begins from Nova Scotia and goes to Liverpool and Manchester. It is the shortest route between Europe and North America. All the vessels crossing the Atlantic to this country from ports in N. America take practically the same route from 60° W. longitude. For a part of the year, often less than half, the St. Lawrence steamers make an exception to this by going north of New Foundland. Even the vessels from Florida and the Gulf Coast follow the same northern route. In this way it is clear that the N. Atlantic route is a great trunk route with a string of branches for the different ports from St. John in Newfoundland to Havana, Tampico and Veracruz in the tropical Gulf.

(2) The N. Atlantic route has the great advantage of being entirely *devoid of islands* with the exception of Sable Island—the so-called graveyard of the Atlantic—east of the Maine Coast and a few small rocks on the Grandbanks. These are so much dreaded that the steamer sail 60 miles distant from these land specks. Besides these land specks, there forms a dense fog near Grandbanks from the mingling of the cool and warm waters of the Arctic and Gulf stream currents. Moreover there are icebergs that are a greater menace to the Trans-Atlantic liners. Another dangerous part of this route is Cape Hatteras, which stretches out into the sea with its sand bars and this has to be rounded by hundreds of vessels from the south.

(3) It is also the *greatest travel route* of the world and the *greatest freight route* and consequently the route possessing the largest, fastest and most complete ships that were floated. It is upon this route that have occurred the fiercest fights for international supremacy. The N. Atlantic traffic has always been of a dual nature. The emigrating European has been finding a home and the manufacturing European has been finding raw materials.

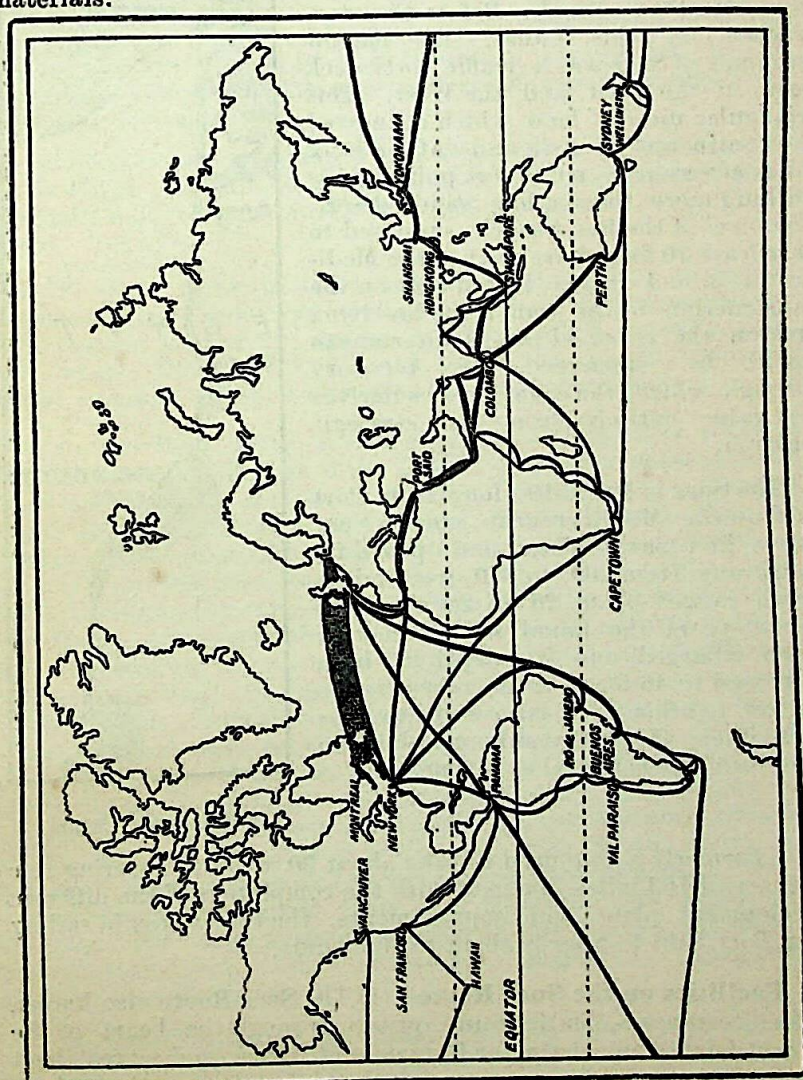


Fig. 40. Ocean Routes.

(4) Now, as always, the return freight is of much smaller quantity and higher value, so that many of the ships go out fully

laden and most of them come back with partial cargo and many with no cargo whatever except worthless ballast.

Suez Canal Route

Of the two epoch-making events of the 19th century that revolutionised ocean navigation in the world, one was the advent of the steamship, and the other, the opening of the Suez Canal. Before the construction of this Canal, the narrow isthmus of Suez was a traffic bottleneck between the East and the West. This triangular piece of land which connected the continents of Asia and Africa is 72 miles across at its narrowest point and is nothing more than a low sandy desert. The level of the Red Sea was supposed to be at least 30 feet above that of the Mediterranean and it was feared that on the construction of the canal, the low lying area on the coast of the Mediterranean would be submerged. The territory through which the canal passes derives its value entirely from its strategic location.

The Suez is 103 miles long from Port Said on the Mediterranean side to Suez on the Red Sea. When first opened its width was from 200 to 320 feet and its depth ranged from 26 to 28 feet. In recent years the Canal has been very much enlarged and its depth has been increased to 46 feet. Even now it is too narrow to allow two large ships to pass each other. Normally only one ship can pass through the Canal at a time.

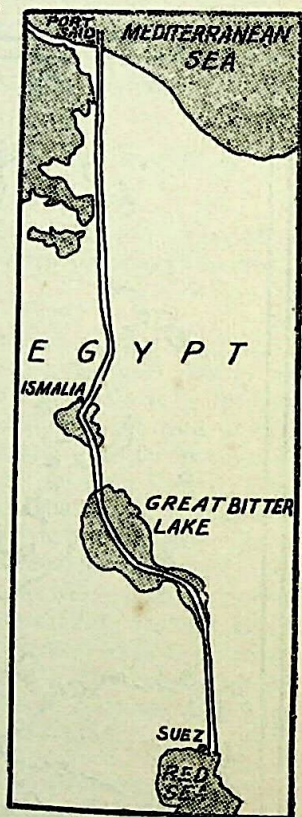


Fig 41. Suez Canal

Formerly a ship used to take about 30 hours in covering this distance of 103 miles. But now with the completion of the different development plans and improvements, the time taken in sailing from Port Said to Suez is about twelve hours.

Facilities on the Suez Route—(1) The Suez Route also known as Mediterranean-Asiatic route passes through the heart of the "World Island" consisting of Eurasia and Africa, and serves about 75% of the world's total population inhabiting in these three continents.

(2) This route connects two great types of Western civilizations of Europe and America with the great Oriental civilizations of India, Japan and China.

(3) The traffic on this route consists of manufactured goods of all stages of industry, such as those of the completely mechanised industry of North America and Europe, the most elaborate products of the cottage industries of India, Japan and China, and the crudest products of the salt industry of the Sahara desert.

(4) The route has two terminals on the west and four on the east. In the west it has its main feeders in Europe, but has an important branch on the Atlantic coast of America extending from Houston to Montreal.

(5) In the east one branch goes along the south-east coast of Asia to China and Japan in the north-east; two branches go to the south-east to serve Australia; and one branch goes to East Africa.

The Suez route is truly a trunk line. It has numerous branches serving the two northern and the two southern continents of the eastern hemisphere, finally reaching the U.S.A. and Canada in the west. Every great gulf and sea in the broken coasts of Europe and Asia supply a branch to the main trunk route.

(6) The Suze route is well supplied with oil fuel which is obtained from the oilfields of the U.S.A., Caribbean coast of south America, Rumania, Russia, Iraq, Iran, Saudi Arabia, Bahrein Island, Kuwait, Indonesia, Burma and British Borneo. Only the western coast of Europe and the eastern coast of Asia are without oilfields. On this route there are more oil fuel stations than coaling stations and the ships find no difficulty whatever in obtaining oil. On the other hand this route is well supplied with coalfield at its extremities, but with the exception of India its middle part is devoid of coal. Coalfields at its western termini are those of eastern U.S.A., Novascotia, Great Britain and Germany. At the eastern termini there are the coalfields of Japan, China and Australia. The coaling station on the middle part are supplied with imported coal. The Mediterranean coaling stations obtain their coal supplies from Great Britain whereas the coaling stations situated in the Indian Ocean import their coal from South Africa and Australia. Singapore as well as the coaling stations situated to the east of Singapore import their coal supplies from Japan and Australia. The chief coaling stations on this route are Gibraltar, Algiers, Port Said, Aden, Colombo, Singapore, Hongkong, Shanghai and Yokohama.

Nationalization of the Canal—On 26th July, 1956, came the historical declaration of the President of Egypt nationalizing the Suez and replacing the company by a newly constituted authority. This led to a conflict between the U.K. and France on the one hand

and Egypt on the other. The result was a temporary closure of the canal.

The result was that the prices of consumer goods imported by Asian countries from Europe and America went up and Europe faced an oil crisis. U.K. decided to curtail imports, many countries took recourse to oil rationing. Sweden and Switzerland prohibited weekend driving and tea prices went up in the U.K. Petrol shortage affected the motor car manufacturing and oil refining industry in the West. Shipping rates went up and there was a drastic fall in the Gold and Dollar reserves of the sterling area.

Importance of the Canal for the International Business World—Even a temporary closure of the Suez Canal will adversely affect the economy of the countries of Asia and Europe as has been evidenced during 1956 and then again during the U.A.R.-Israeli conflict in 1967.

(1) A change in route adversely affects the demand in western countries for the raw material that are now being supplied by Asian countries. The terms of trade, therefore, become unfavourable for the countries of Asia. A part of the trade in raw materials is diverted to the countries of South America and Africa.

(2) The freight rates increase not only on account of increase in distance travelled, but also on account of the scarcity of bunker fuel on the Cape route, and lack of sufficient way-cargo, as the Cape route passes through a sparsely populated area.

(3) On account of increase in freights, the tramps gain traffic at the cost of liners. Air traffic gains at the cost of ocean traffic. Transport of passengers, perishable goods and valuable goods adds to the volume of air traffic, with consequent loss to ocean traffic.

(4) An increase in the price of imported manufactured goods from Europe and America affords protection to the infant manufacturing industries of the Asian countries. But this advantage is more than offset by the rise in the prices of the capital goods imported from Europe and America for the establishment or expansion of such industries.

(5) The export of most of Indian raw materials is adversely affected. The commodities whose overseas markets is be adversely affected are oil seeds, tea, manganese, cotton, wool, hides and skins, vegetable oils, tobacco and coffee. South America and Africa is capture part of the market for the commodities at the cost of India. The fall in the exports of our agricultural commodities is inflicts loss on farmers, and causes shrinkage in our foreign exchange earnings. Loss of foreign exchange together with the increase in the prices of imported capital goods gravely upsets the progress of our Five Year Plans. Delay in the

delivery of capital goods required for the execution of our numerous projects upsets the scheduled fulfilment of our Five Year Plan.

Our exports might go down on account of the extra freight of 20 per cent or so which will reduce their competitive capacity in the case of many items including traditional ones. The additional freight will also increase the price of food-grains. Projects depending on imported aid cargoes from the U.K. Continent, U.S.A., the U.S.S.R. and other countries will be held up due to their late arrival.

While the traffic to the U.K. and Continent will badly suffer because of the diversion and that to the U.S.A. somewhat less, the Black Sea route will be the worst affected as the increase in the length of the voyages will be proportionately much more. The port surcharges, which have been decided on by Conference lines to cover the additional expenses involved on account of the longer voyages, will remain in force till normal traffic through the Suez Canal is resumed.

Liner companies, which have to provide regular services in abnormal as well as normal times, will be adversely affected on all the routes, by the upsetting of their voyage schedules and diminution in the volume of cargo available.

Due to many reasons, the total traffic might shrink on account of the diversion and the disturbed conditions and to that extent the revenues of shipping companies will fall.

Wayside cargo, picked up on the India-U.K. Continent route through the Suez, which is quite considerable will be lost. Ships might also be deprived of some important cargoes especially perishable articles or those in whose case delay in transit will be a serious disadvantage, and their value in terms of freight might be quite huge.

(6) Among the European countries, Great Britain will be the greatest loser on account of its being the greatest user of the Suez Canal. Her imports of oil from the Middle East will be cut down to 15%. This will cause a serious industrial crisis in Great Britain. Great Britain will also lose many of her Asian markets for consumer goods. Her exports of cloth to the East will suffer a great setback, as the competition from India and Japan will prove too formidable for her. A rise in the prices of imported raw materials will increase the cost of production of manufactured goods in Europe. In that case the already inflated economies of West European countries will get worse. In case they choose or are forced to depend on American oil, the existing dollar gap will be widened still further much to the detriment of West European economies. Moreover, the closure of the Suez will place European Russia farthest by sea route from the countries of the South-Eastern Asia and the value of the Mediterranean as an international highway will be reduced to nullity.

(7) Oil tankers travelling from New York to Persian Gulf save approximately 3,500 miles each way. As compared with the cape route a ship saves about 14 days' time, which means approximately \$28000. After deducting \$5,400 in Canal dues, the ship makes a net saving of about \$22,600. The closing of the Suez Canal will, therefore, prove costly to the U.S.A.

(8) A temporary closure of the Canal will deal a serious blow to the oil companies operating in the Middle East as well as to the national economies of Middle East countries, over 90% of whose income is derived from the petroleum royalties. At present Europe obtains Middle East oil at the rate of 1.2 million barrels a day through the Suez Canal and another 8 million barrels through pipelines to the Mediterranean. America obtains .35 million barrels a day through the Suez Canal. Thus the total oil export from the Middle East countries to Europe and America amounts to 2.35 million barrels a day. The closure of the Suez route will mean a serious reduction in the dollar earnings of the Middle Eastern countries.

That makes it more than evident how Suez route is the life-line and backbone of world commerce.

Advantages from the Suez Route—The Suez Canal has provided a short cut from the Atlantic Ocean and the Mediterranean Sea on the one hand to the Indian and Pacific Oceans on the other. The opening of this highway has saved a long distance on the voyage from Europe and the eastern coast of North America on the one side, to Asia, Australia and East Africa on the other. Ships sailing from Liverpool to the Far East and Australia find it shorter *via* Suez as far east as Sydney and Brisbane.

(1) The ships sailing from Bombay and Calcutta to Europe and North America save more distance by using the Suez route than the ships clearing from Singapore, Batavia, Sydney, Hong-kong and Yokohama.

(2) The Canal has proved more useful to the countries of Europe than to the countries of North America. Europe has developed into a very important market for wheat, jute, rice, tin, rubber and tobacco of south-east Asia. It could not have been so without the shorter haul and the consequent lower freight charges. Statistics go to show that within 15 years of the opening of the Suez Canal prices of certain eastern commodities in European markets has dropped by 25 to 35 per cent.

(3) The canal has proved of greater importance to the liners than to the tramps as the liner aims at speed whereas the tramp seeks economy. All liner traffic between the European ports and those of Asia and Australia pass *via* Suez Canal. As regards tramps, they use the Canal when the traffic rates are high, but when the traffic rates are low, they use the cheap route *via* the Cape. All tramps sailing from Australian ports for Europe follow the Cape-

route and those sailing from ports east of India do so only when the freight rates are low.

(4) Out of the total tonnage of the different companies that passes through the Suez Canal 85% belongs to Europe and only 15% to the U.S.A. and Canada. In 1938, Suez Canal and Panama

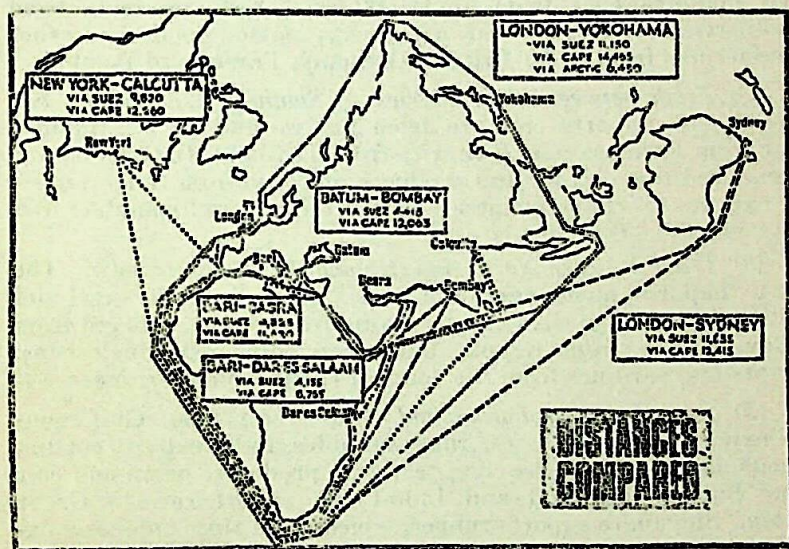


Fig. 42

Canal handled approximately the same amount of traffic, but now Suez handles three times as much as Panama. Between 45 to 50 ships travel through the Suez Canal every day, over one-third of which are British. Increasing exports of oil from the Middle East countries is giving rise to ever-increasing traffic along the Suez Canal. Suez handles about one-sixth of all the cargo that moves by sea throughout the world.

Cargo Traffic on the Suez Route—There is plenty of way-side cargo for ships plying on this route. There are as many as eight traffic divisions on this great ocean route which almost circumnavigates the world.

(1) *Trade between countries of the Black Sea and the Mediterranean Sea and France and Italy*—The west bound traffic consists of Middle Eastern oil conveyed by pipelines to the ports of Lebanon and Israel, maize from Yugoslavia, grain and manganese from Russia, tobacco and chromite from Turkey and wool, hides, skins and other products from the countries of the eastern Mediterranean. The east-bound cargo consists of manufactured goods, such as cotton textiles, iron and steel goods and machinery.

(2) *Trade between the countries of Western Europe and the countries around the Mediterranean Sea*—The west-bound traffic consists of wine, oranges, lemons, fig, raisins, olives, early vegetables and phosphate from North Africa, sulphur from Sicily, cotton from Egypt, and other foodstuffs and raw materials from the eastern Mediterranean and Black Sea regions. The east-bound cargo includes coal from South Wales, forest products from Scandinavian countries and machinery, cotton goods and other manufactures from Great Britain, Germany, France and Belgium.

(3) *Trade between the countries of Southern Asia and the Far East*—Japan imports iron ore from Malaya and the Philippines, sugar from Famosa and Java, rice from Thailand, Indo-China and Burma, and raw cotton, jute products and iron from India. Japanese exports to these countries consist of coal and manufactured goods, chiefly cotton goods.

(4) *Trade between North America and the Mediterranean*—The U.S.A. imports manganese from Russia, cork from Portugal and Spain, fluospar, pyrites and iron ore from Spain, tobacco from Turkey, cotton from Egypt, and olives, olive oil, wine, raisins, currants and sardines from the countries of the Mediterranean.

(5) *Trade between Europe and Asia*—The Persian Gulf countries export oil, wool, dates, rugs and hides. India exports cotton, oilseeds, hides, manganese ore, tea, jute products, hemp and coir fibre. Burma, Thailand and Indo-China export rice to Great Britain. Singapore exports rubber, spices and tin. Indonesia exports spices, sugar, tobacco, coffee, tin and copra. The Philippines exports coconut, copra and manila hemp. Japan exports raw silk and tea. In return, the West European countries, especially Great Britain, send locomotives, iron and steel goods, machinery, cotton goods, chemicals, clothing, manufactures and provision goods.

(6) *Trade between North America and the Far East*—Westbound traffic consists of tobacco, spices, tin, rice, rubber and fibres from the countries of south-east Asia, tea from India and Ceylon, and jute bags, manganese and shellac from India.

(7) *Trade between Australia and Europe*—Australia is served by two branches, namely, the European mail route that goes down from Ceylon and small branch line that goes from Singapore through Torres Strait to Brisbane and Sydney. Australia exports wheat, wool, meat, sugar, mutton, dairy products, tin, lead, copper, gold and timber in exchange for manufactured goods from Europe.

(8) *Trade between the eastern coast of Africa and Europe*—Africa exports cloves, coffee, sugar, nuts, coal, tin, copper, chrom of radium, mica, hides and skins in exchange for the manufactured goods from Europe.

The tonnage of cargo that moves northward from east to west of the Suez is more than four times as much as is carried southward from west to east of the Suez. The reason for this is that the

east sends bulky raw material to the countries of Europe and North America and receives in return from the west manufactures having large value in small bulk.

Panama Canal Route

The Panama Canal was opened on the 14th of August 1914. As a matter of fact soon after the construction of the Suez Canal proposals began to be framed about breaching the Panama isthmus so as to connect the Eastern Sea board of North America with the Pacific Sea coast in the west through a shipping canal. It was with great difficulty that Panama Canal could be completed because (1) the State of Panama was in the throes of a great political upheaval and (2) the land consisted of hard rocks, which had to be cut before the canal could have been effective. Even now the Panama Canal works by a system of locks and the U.S.A. has full control over it.

Panama Canal is 40.5 miles long from end to end but from one deep water end to another deep water, its length is 50 miles. It is 41 feet deep and the ships usually take 7 to 8 hours to pass through it. Everyday it can handle about 48 ships. A system of locks at six places controls the rise and fall of 85 feet in the level of this canal. Manipulation of these locks takes a lot of time and is sometimes quite inconvenient.

Advantages from Panama Canal—(1) The U.S.A. has been able to achieve coordination between the defence arrangements of its Atlantic and Pacific oceans. In the absence of this canal, it had to maintain two navies.

(2) The Eastern and Western Sea boards of North America have been brought into very intimate relationship.

(3) The distance between the Pacific Coast of South America and the Atlantic Coast of North America has been reduced.

<i>From New York</i>	<i>Valparaisio</i>
<i>Via Magellan Str.</i>	8,400 miles
<i>Via Panama Canal</i>	4,600 miles

(4) Australia and New Zealand have been brought closer to the U.S.A.

<i>From New York</i>	<i>To Wellington (N.Z.)</i>	<i>To Sidney (Australia)</i>
<i>Via Panama Canal</i>	8,500	97,00
<i>Via Magellan Str.</i>	11,300	13,400

(5) Europe now has an alternative route to Australia and New Zealand. Ships moving *via* Panama Canal save 200 to 600 miles in distance over Suez Canal route.

(6) The distance between the ports of Japan and the U.S. ports on the Atlantic Seaboard has been reduced by about 3,400 miles and such trade has increased.

(7) The distance between the Eastern and Western sea Coasts of the U.S.A. has been reduced by 7,009 miles and as a result of that, there was a great spurt in trade between the two coasts but it was shortlived because soon it was replaced by trans-continental road and rail transport.

(8) Europe is near to the Western Coast of North and South America by about 500 miles.

(9) The trade between the U.S.A and the Far East has increased.

The Panama Canal route is well supplied with fuel. American coal and oil is available in plenty and on quite cheap rates.

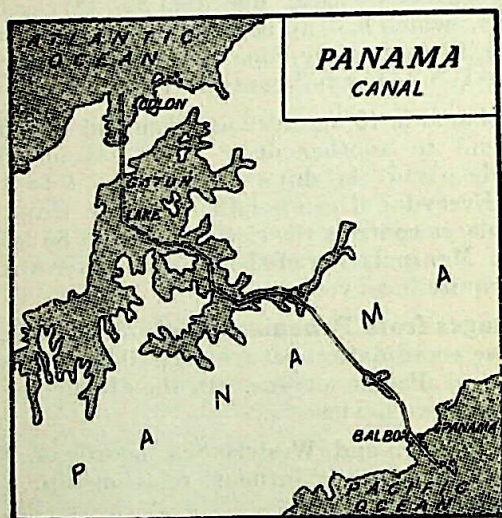


Fig. 43

Defects of the Panama Canal Route—(1) The system of locks is both inconvenient and wasteful.

(2) The region served by the Panama Canal is thinly populated, less productive and less important from the point of view of trade also.

(3) There are fewer ports and islands on the way.

Comparison between Panama and Suez Canal Routes

Suez

1. Suez route passes through a very thickly populated region where land is fertile and production varied.

Panama

1. Panama Canal passes through a comparatively thinly populated area where both the production and opportunities of trade are meagre. It generally serves poor, mountainous and desert regions.

Suez

2. Suez Canal is an Indian Ocean Canal.
3. Suez canal has a large number of ports and islands on its way from where cargo can be picked. Therefore, it is full of traffic all through.
4. Both coal and oil are easily available on cheap rates.
5. Europe and U.S.A. maintain their trade with Asia and Australia through the Suez Route.
6. Suez Canal has greater length, is less deep and quite narrow so that the ship journey is quite annoying.
7. The Suez Canal dues are higher.

Panama

2. Panama Canal is a Pacific Ocean Canal.
3. Panama Canal has very few ports and islands on its way. Naturally the facilities for picking cargo is limited. As such it is not so full of traffic. Hawai is the only port on this route in the Pacific.
4. American coal and oil is available in plenty and at cheap rates.
5. Eastern Coast of America and W. Europe trade with the Western Coast of America through this canal ; the trade between U.S.A. and China, Japan and Philippines also passes through this canal.
6. The Panama Canal is shorter in length, has the inconvenient system of locks and ship journey is quite annoying.
7. The Panama Canal dues are cheaper.

On the whole, there is a greater trade and traffic on the Suez Route than on the Panama Canal Route.

Some Important Inland Waterways

The chief means of inland water transport are the rivers, canals and lakes. But in order to be useful for navigation, these must fulfil certain conditions.

Conditions essential for navigable waterways. (1) The rivers, canals and lakes must be deep and perennially full of water. Waterways which are subject to floods during the rains or low water level in the period of drought are useless for navigation. Swift flowing currents or those which have rapids and waterfalls in their course also remain useless for navigation.

(2) The navigable waterways should not be frozen for any part of the year and they should meet a sea or an ocean which remains open all the year round. Transport is limited on rivers which fall into inland seas or the polar seas.

(3) The waterways must course through densely populated regions rich in minerals and agricultural produce, so that there is sufficient traffic.

Regional Distribution—Water transport is the best for internal trade and commerce. No doubt it is slow, but it is cheap and it can be used freely without any care of wear and tear. The inland waterways have developed the most in the following three regions :—

(a) Western Europe (b) U.S.S.R. (c) U.S.A.

(a) *Europe*. The mainland of Europe possesses some phenomenal natural advantage which have favoured the development of waterways.

(1) Irregular coastlines make short and easy communication between the interior and the sea—the cheapest of all highways. Hence, it is natural that the greatest trade routes of Europe should be water routes and that its railway mileage should be relatively low.

(2) Trade is further favoured by the location of the inland seas that indent the European Coast.

(3) Europe possesses no large isolated plateaus and it is well supplied with navigable rivers.

European commerce has developed two sorts of commercial routes.

(1) The heavy traffic routes, which are chiefly water routes, and (2) the fast traffic routes, which are chiefly overland routes. In each group there are two classes, Primary and Secondary or trunk lines and branches.

Heavy Traffic Routes :—

(a) *Southern Trunk Line* or Mediterranean and Black seas.

(b) *Northern Trunk Line* or North and Baltic seas.

The *Southern trunk line* is poor in branches. There are two navigable rivers of third-rate importance the Ebro and the Po, in addition to the second class Rhone. The Black Sea traffic is further enriched by the steamers on the Dniester, the Dnieper, the Don rivers.

The great *Northern Trunk Line* terminates at Leningrad and Petrograd. It receives more navigable rivers. Two of these are the Rhine and the Elbe rivers, which must be classed as of the first magnitude if measured by the commerce that they carry. Rhine also carries great commerce down it. The Elbe is not connected with the Danube by canals. Besides these there are numerous other rivers in the N. European plain and various canals which drain the plain of N. Europe from the west of France to Central Russia.

The gentle topography and easy drainage of N. Central Europe thus give many avenues to the sea and make possible east-west waterway, especially in Germany, that duplicate to some

extent the service done by the Great lakes of America. The Volga and the Caspian form the greatest and most successful inland transport system. The Volga system flows from Moscow to the border of Russia and passes through lumbering, grain producing and manufacturing and oil producing regions.

The greatest development, however, has taken place in Germany and France. Rhine, Weser, Elbe and Oder are the chief rivers of *Germany*. These rivers have been inter-connected by means of canals and thus a network of inland waterways makes up the deficiency of sea board.

River Rhine is 235 miles long and falls in the North Sea. Ocean-going ships can move through this sufficiently inland upto Colon but small boats can move upto even Mainz, Mannheim and Strasburg. Because of the excess of traffic in coal, this river has been called the coal river. The steel industry of Germany is established on its banks and almost at a distance of every 30 miles we find towns with a population of more than 100 thousand. Therefore, foodgrains are also transported over this river. Fuel and minerals are other lines of traffic passing through this river. Every year it handles about 50 million tons of cargo. The cargo-moving inland is, however, more than that moving towards the sea. Antwerp and Rotterdam are important port towns situated at its estuary in Belgium.

River Elbe comes next in importance. This is navigable not only in Germany but also in Czechoslovakia. Dresden, Magdeburg are important industrial towns on its bank and chinaware, chemicals, sugar are the main lines of manufacture. Hamburg is the port town.

River Oder is also navigable and it passes through the industrial and mining district of Silesia. Breslen and Frankfurt are important towns.

The beauty of the German river transport system is the arrangement of interlinking canals. Weser and Elbe rivers have been linked at Magdeburg and Hamburg. The Hansa canal connects Hamburg with Ruhr region of the Rhine valley. Even the waters of the Danube have been joined to Mainz, tributary of Rhine by means of Ludwigs Canal.

France has also a very developed system of water transport. Important rivers have been interlinked by means of canals and excepting the upper reaches, rivers of France are navigable throughout. Seone, Seine and Loire make excellent waterways. Rhone is, however, not useful for navigation even though after flowing for 500 miles from north to the south it falls in the Mediterranean Sea.

Other countries build their steelworks on waterways ; *Czechoslovakia* now feels the need to bring waterways to its steelworks. The Danube-Oder-Elbe Canal, of which Czech engineers have been

dreaming for 70 years, may now come true in what some people call the "historically near future". The project is for a system of canals 270 miles long which would connect four important Central European waterways; the *Danube*, the *Elbe*, the *Oder* and the *Vistula*. The possibility of bringing iron ore to Ostrava, the heart of the Czech steel industry, and of carrying its products by water is the main but not the only benefit expected by Czechoslovakia from this large work, which it is hoped to complete in 13 years from now at a cost of £ 200 m.

A chain of pumping stations would be constructed to pump Danube water into the Czech rivers and channels. Hydroelectric power stations, totalling 6,000 M.W. would also be built to provide power for these pumps. This would correct the injustice of nature which shaped the country in such a way that all water flows away from it.

However important the project may be for the Czechs, they could hardly attempt its realisation without support from their neighbours. If these are now willing to give a hand, it is because the benefits of the project are bound to spread over a much wider area.

In addition to Poland and East Germany the entire catchment area of the Danube is likely to benefit. This is a region of about 3,26,000 square miles extending into eight different countries from West Germany to the U.S.S.R.

The Danube, no longer blue but resembling rather a sewage channel as it leaves Vienna, once again proves to be a great unifier. Its cargo traffic has risen over the past 10 years from 9.2 m. to 25 m. tons and the Danubian commercial fleet consists now of 717 tug boats with a total haulage power of 3,56,000 H.P.

As a frontier river, it brings neighbours closer together, rather than separating them. It is not merely a commercial highway. Joint hydroelectric projects are being considered between Austria and Czechoslovakia; Czechoslovakia and Hungary. The Iron Gates dam, a joint project of Yugoslavia and Rumania, should be complete in 1970, creating a lake which will reach as far as Belgrade, 125 miles upstream.

By 1975 the Danube will be linked in West Germany with the Rhine through the River Main by a canal capable of carrying 1,500-ton vessels. Work on this project began in 1962. When completed, it will provide the European waterway network with an East-West artery over 2,000-mile long between the Rhine delta and the Black Sea. The Danube-Oder-Elbe canal would link the West European Rhine network not only with North-East Europe but also with the Soviet waterway system between the rivers Bug and Dnieper.

The first step towards the realisation of this grand plan would be the raising of the Danube's level between Vienna and Bratislava by a dam to be constructed jointly by Austria and Czechoslovakia.

One of the arguments against it stems from fears that it would destroy the biological self-purifying capacity of the river, that the living organisms which clean the river could not stand that the cold water of the deep basins. This sort of argument will be encountered at every step. To play with water is a dangerous game which may benefit but can also endanger life and countryside.

Another problem, the pumping of water from the Danube into the Oder and Elbe systems does not seem to present any great difficulties. One to two per cent of the Danube's waterflow taken at the high-water period would be sufficient to raise the flow in the North-flowing rivers by as much as 50 per cent in their dry period. Power needed for pumping would be provided by power stations in other parts of the system.

The South-North link could not be effected entirely by water. On the Elbe branch of the canal it will be necessary to overcome two high steps of 330 and 360 feet by 1-1/4 mile-long inclined rail lifts so that the barges would travel this distance over dry land.

(b) *U.S.S.R.* The Soviet Union has extensive rivers whose total length is about or even more than 65,000 miles. Dwina, Volga, Don, Dnieper and Dniester are some of the important rivers of the European part. In the Asiatic part of the U.S.S.R., Ob, Yennessi and Lena are the most important rivers. The chief defects in these rivers are that while the northern part of the Asiatic Russia is frozen for six months of the year, most of the rivers of the European part fall into inland seas like the Black Sea or the Caspian Sea. In spite of these inherent defects, the rivers of U.S.S.R. are very important lines of transport. The following are the main defects and advantages.

Defects. (1) Most of the rivers fall into inland seas or in Arctic Ocean.

(2) The rivers are icebound in winter.

(3) Water level falls in summer.

Advantages. (1) The rivers have a great length.

(2) The gradient is uniform and the flow is steady.

(3) All the Russian rivers have a large number of tributaries.

(4) All the rivers flow through agricultural regions.

(5) Hydro-electricity is also generated.

Most Important Rivers and Canals

Lena	2,664 miles	Baltic—White sea canal	235 kilometre
Obi	2,508 miles	Moscow—Volga canal	130 kilometre
Yennessi	2,360 miles	Volga—Don canal	101 kilometre
Amur	2,702 miles	Nevonomansk canal (Black Sea to Caspian Sea)	
Volga	2,278 miles	South Ukrainian Canal from Dnieper to Sea of Azov)	3,000 miles
		Turkemenian canal from Amu Darya to Caspian sea)	700 miles

Volga is the most important river of Russia and it passes through half of the territory. 25% of the total trade passing through water transport moves over the *Volga*. *Volga-Don Canal*, which was opened in 1952 has not only given a 540 miles long waterway between Rostov and Stalingrad but it has also inter-connected the White, Baltic, Caspian, Azov and Black seas into one system of navigable channels. On the completion of two canals now under construction, it would be possible to go from Moscow to Central Asia.

(c) *U.S.A.*—The extent of navigable waterways in the *U.S.A.* is about 20,000 miles. Missouri-Mississippi system is the most important. As it falls into the Gulf of Mexico, it forms a delta at its mouth and finally is subject to occasional floods in its lower reaches. Only its upper part is utilized for navigation all the year round. Light ocean going ships can move over the Mississippi 2,000 miles inland upto St. Paul. Its tributary Ohio is navigable upto Pennsylvania and coal is the main line of traffic. Missouri which joins the Mississippi at St. Paul is navigable upto the Rocky Mountains in the west.

The Missouri-Mississippi system has been connected by means of canals with the Great Lakes and then with the St. Lawrence system. The St. Lawrence waterway, however suffers from the following disadvantages.

(a) The St. Lawrence estuary is always engulfed in fog.

(b) Some part of it is ice-bound in water.

(c) At certain places, especially in the upper valley, waterfalls occur.

The out-going freight is exported through the side doors of this continent—one to the north and the other to the south *i.e.*, the Hudson Bay and the Gulf of Mexico. The Mississippi river with its outlet into the Mexican Gulf joins the transport line of N. Prairie to the outgoing steamship line.

Through Hudson Bay it is cheaper by 5 or 6 cents per bushel than through the lake route. It is hoped that the wheat load of spring will be sent through Port Nelson than through Port Arthur. But the greatest difficulty in its extensive use is that it is blocked with ice for the major part of the year.

The chief lakes which play an important part are the Great Lakes which have been connected together through canals and now form a very good and cheap waterway. Large sized boats and steamers pass and mechanical loading and unloading are current here. These factors of economy explain why the lakes draw the traffic and why the lake cities have grown.

5. MAIN LAND ROUTES OF THE WORLD

U.S.A.—The *U.S.A.* is well furnished with trade routes and transportation lines. It has got roads, river, lakes, canals,

trains etc., which make transportation cost still less. There is, however, a large traffic of an essentially transcontinental character. Thousands of carloads of fruits, manufactures and lumber are exchanged between manufacturing east and west. This country is crossed from east to west by eight or nine railways. There is S. Pacific railway running between San Francisco and New Orleans. The northern routes, Canadian National, Canadian Pacific, Great Northern Pacific with their termini on Lake Superior, utilize the cheap water transportation of the lakes. The greatest activity in trans-continental road building is to be found in the North, where there is enough rainfall to mitigate the desert conditions.

The net work of railways in the U.S.A. carries fresh strawberries from California to New York and fertilizers and other manufactures from the east to west. Within a few days, sometimes hours, goods are brought from one part of the country to another.

In many parts of America, distances are so great that automobiles are necessities and not luxuries, to the families. American farmers do not cluster in villages. Some are tens of miles from their nearest neighbour, and hundreds of miles from two sizable towns. The large scale farming which is common in many parts of the United States today did not become profitable until there were trucks and tractors to do the work, farmers could not afford to hire other men to do. Trucks carry their grain to storage elevators, their milk to creameries, their vegetable to market. Trucks and cars go everywhere there is road, and America's three million miles of roads have brought every field and barn into the circle of civilization.

The family automobile has helped to bring people of the United States two other things they wanted—two things which they thought impossible to have at the same time—community life and privacy. In the early days of industry, people who worked in factories lived close together, within walking distance of their jobs. As industries grew, more and more people had to live together in crowded conditions. But as men built longer and better roads, and automobiles and other types of rapid transportation became available to almost everyone, people did not have to live near their jobs. New residential districts grew up outside the big cities, more and more cities became places of work only. Every morning millions of Americans drive their automobiles to work, sometimes a distance of fifty miles.

Automobiles have helped make this possible. More than this, automobiles and other methods of fast transportation are changing American industry. Factories are being built far from cities, in isolated or undeveloped areas. Because the means of transportation are available, it is no hardship to bring people, as well as materials, to the places where they are needed.

Europe—It includes rail roads. Paris and London are the Railway centres. There are, however, two transcontinental lines. One is the trans-Siberian and the other the trans-Caspian. They connect the manufacturing cities of west Europe with the cattie ranches, agrarain fields and farms of the more sparsely peopled lands or Russia's almost unsettled territory in N.W. Asia.

(1) The Paris-Berlin-Moscow route, (2) Paris-Milan-Brindsi route and (3) Berlin-Vienna-Istanbul route may also be called the trans-continental railway systems of Europe.

Asia—The continent of Asia is faced with many difficulties regarding the transportation system.

(1) Its huge size—which divides its different parts by enormous distance.

(2) The formation of the land.

(3) The absence of inland seas such as are in Europe.

(4) Absence of rivers flowing from the great central region,

(5) Deserts and Mountains add to difficulties.

Caravan Routes—These use all kinds of pack animals, horses, mules, donkeys, yaks and men as pack animals in the mountains, camels in the desert and wagons and sledges on the flat plains.

The most important branch of this overland trade was that with and through Siberia, the routes from Peking and Hankow combining and reaching lake Baikal by way of the Desert station of Urga.

The Chinese Caravan route next in importance passes up the Hwang Ho Valley, across Chinese Turkestan into Russian Turkestan.

The third route of lesser importance connects Chengtu, the capital of the Szechwan on the upper Yangtze, with Lhasa and Tibet. While the fourth connects Yunnan a mining city in S.W. China with Bhamo in upper Burma.

Railways : (1) Trans-Siberian Railway, which carries very urgent and very valuable freight.

(2) Trans-Caspian Railways.

(3) Baghdad railway route of W. Asia.

Africa—The Cape-to-Cairo route covers a distance of 9,000 miles, which is negotiated by means of railways, roads and river-lake transport. It consists of the following sections :

1. Railway from Capetown to Elizabethville.

2. River and caravan route from Elizabethville to L. Victoria.

3. Motor road from L. Victoria to Nile Gorge.

4. Navigable waterway from Nile Gorge to Khartoum.
5. Railway from Khartoum to Wadi-Haifa.
6. River transport from Wadi-Haifa to Shaical.
7. Railway from Shaical to Cairo.

S. America—There are four trans-continental railways. The most important is, however, the one which connects Buenos-Aires with Valparaiso. It is 900-mile long and mostly carries post and passengers. It suffers from the difficulty of transshipment because of the difference in gauge system of Chile and Argentina.

Australia—One trans-continental railway connects South East Australia with Western Australia and another runs from Darwin to Adelaide. But because of the development of Air and Ocean transport, the railways do not handle much commerce.

Trans-continental Railways

The two most important trans-continental railways of the world are (1) Trans-Siberian Railway of Eurasia, and (2) Canadian Pacific Railway of Canada.

Trans-Siberian Railway covers a distance of 5,400 miles and connects the European part of the Soviet Union with the Far East. It runs from Moscow in the West to Vladivostok in the East. This has facilitated exploration and development of Siberia. Besides the political and strategic importance of this route, it is the main artery handling agricultural and mineral produce of Asiatic Russia. Then, the growth of population and establishment of industries and towns have followed in the wake of this railway.

This is a single track railway and the main stations on the way are Omask, Irkutsk and Vladivostok. A branch line connects it at Harbin with Mukden and Port Arthur. Another branch line goes to Peking from Mukden.

Canadian Pacific Railway is 16,641 miles long. It connects the Atlantic and Pacific Sea boards of Canada. Starting at Halifax and St. John, it goes to Montreal. From Montreal to Winnipeg, it passes through the wheat growing lands of Canada. From Winnipeg it moves *via* Regina to Madison Hat in the Rockies. It crosses the Rocky Mountains through the Kicking Horse Pass and Vancouver on the Pacific Coast is its terminus.

The construction of this railway line has brought great development and progress in the political and economic life of the people of Canada. The scattered population of Canada has been brought into one unity by means of this railway and colonization as well as exploration of the interior has been facilitated.

Tarns Saharan Highway

With the signing of a 2,93,000 dollar agreement at the United Nations headquarters recently to carry out a trans-Saharan road study, the long-awaited vision of a trans-Sahara highway,

crossing hundreds of miles from north to south through the world's largest desert in Algeria, took a step towards reality.

The aim of the study, jointly sponsored by Algeria, Mali, Niger, Tunisia and the United Nations Development Programme and scheduled to last eight months, is to assist the four Governments concerned in a preliminary economic feasibility survey of the proposed 1,800 mile-long trans-Saharan highway.

The north-south link, would run due south from El Golea, to near Tamanrasset in Algeria, where it would diverge. Two extensions would then branch off, leading to Gao in east-central Mali and to Tahous in the south-west Niger.

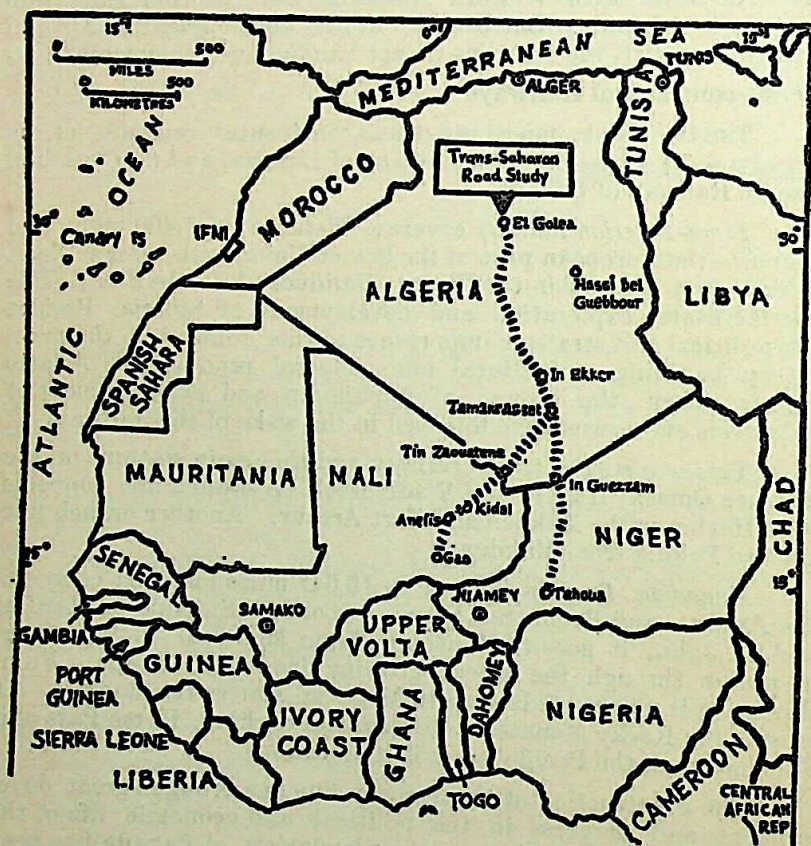


Fig. 44

Economic Advantage—The four concerned countries see in the highway a step forward in the process of their economic development. The highway is expected to expand the present modest trade passing along the existing disjointed roads and tracks and provide quicker and cheaper transportation of the goods now shipped by sea.

The highway is also expected to stimulate the creation of new industrial projects in these countries, as well as help in exploiting natural resources and developing trade in new materials. The creation of a thriving tourist industry is also expected. The highway may thus prove to be the path to economic prosperity for the region as a whole.

More specifically, the four nations hope to see rapid expansion in the traffic of livestock, millets and dates ; transportation of petroleum and fertilizers ; and the ceration of new traffic in frozen meats which would then travel across the region in refrigerated trucks.

At present traffic in desert is minimal because of the danger of vehicles getting bogged down in the sands.

6. MAIN AIR ROUTES OF THE WORLD

Aeroplane flights are of two types :

- (1) Slower flights with many stop-overs.
- (2) Express flights with a few stop-overs.

From the point of view of extent, we may call the flights of the following four kinds :

- | | |
|-------------------|-----------------------|
| (1) International | (2) Trans-continental |
| (3) Regional | (4) Local. |

The great development of aviation for civilian and commercial purposes has taken place in the U.S.A., Canada, N.W. Europe, U.S.S.R. and Australia.

Of all the countries of the world, U.S.A. ranks first in air transport and the traffic by air handled there is often equal to the total of several countries of the world. The country has long distances and even though it might consist of 50 States there are no political frontiers or custom restrictions. People are prosperous and well to do. They want speed and the value of time is very great. Therefore, trans-continental air routes connect the eastern sea-board with the western sea-board. Boston, New York and Washington are connected by air with Seattle, San Francisco and Los Angeles. Besides, there is a network of air routes connecting all the important towns and cities of the country. United Airlines, American Airlines, Trans-World Airlines and Pan-American Airways are some of the most important Air transport compaines of the U.S.A., the last two being international. The U.S.A. has more than 1,64,000 miles of commercial airlines. There are about 6,860 civil and commercial aerodromes in the country and more than 1,600 aeroplanes carry on flights day in and day out to all parts of the world.

England-Australia Route

England-Australia Route is used by French, Dutch and British aeroplanes. Starting at London, it goes to Melbourne *via*

Marseilles, Athens, Alexandria, Cairo, Gaza, Baghdad, Bahrein, Sheraz, Jodhpur, Delhi, Allahabad, Calcutta, Rangoon, Bangkok, Penang, Singapor, Batavia, Darwin, Brisbane and Sydney. This passes over deserts, and dense forests and avoids, as far as possible the crossing of the sea. There are a large number of halts where the

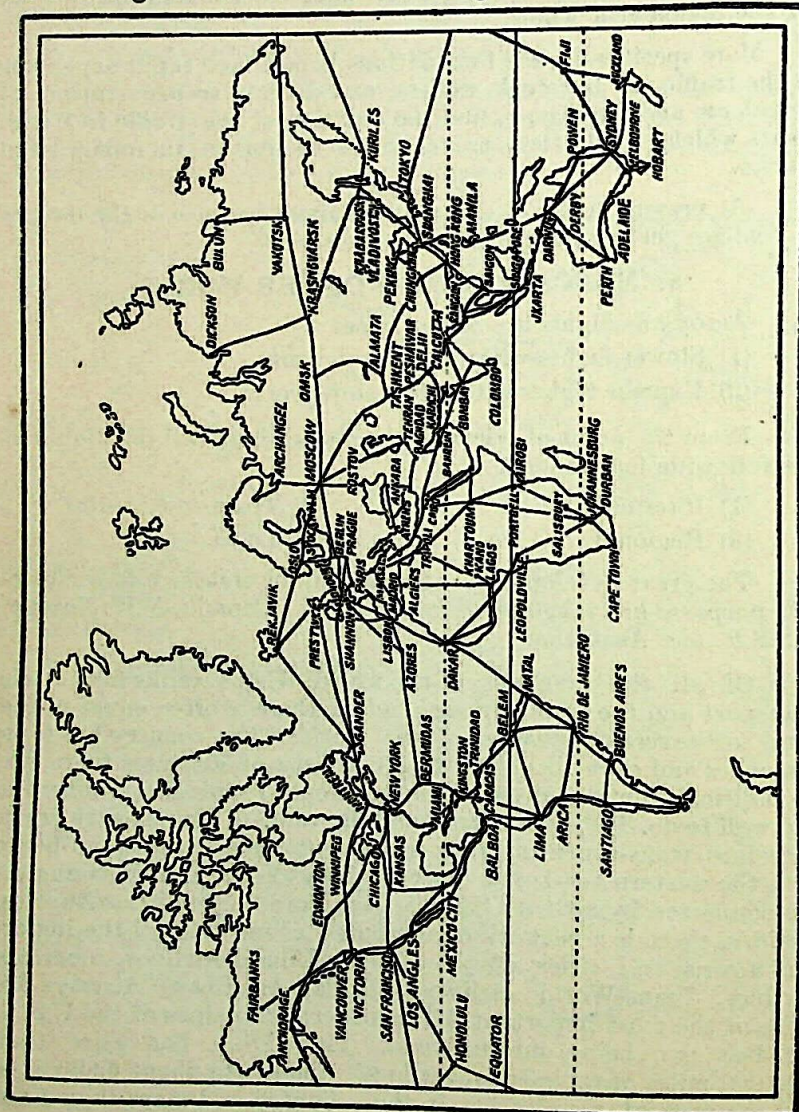


Fig. 45. Air Routes of the World.

passengers are provided rest and the aeroplanes take fuel. One of its branches goes to Darwin via Colombo and another branch goes from Singapore to Japan via Hong Kong. Besides mail and passengers, the other main lines of Cargo are fresh fruits, animals and watches.

The Trans-Atlantic Air Route

French, American and British aeroplanes fly on this route. It has several branches :

- (a) London—Shanon—Gander—Ottawa—New York.
- (b) Paris—Lisbon—Azore—Bermudas—New York.
- (c) Stockholm—Oslo—Rajakvijk—Gander—Ottawa—New York.
- (d) London—Dakar—Natal (Brazil)—Rio-de-Janerio—Buenos Aires.

There has been 18 per cent rise in air traffic over North Atlantic.

Trans-Pacific Route

Trans-Pacific Route is dominated by American planes. Starting at San Francisco and passing *via* Honolulu, Midway island, Bako Isle, they branch off in four different directions :

- (a) Manila—Canton—Shanghai.
- (b) To New-Zealand.
- (c) To Singapore.
- (d) To Tokyo.

World Air Passenger Traffic

International air transport activity in 1967 reached a new peak with 236m. passengers being carried throughout the world (excluding Russia and China) or 18 per cent more than in 1966.

This estimate, released by the International Civil Aviation Organisation, is even higher than the one originally put forward by some airlines of around 250 m. passengers for the year.

The 1967 gain in fact was the largest increase in items of the number of passengers—36 m.—ever known in civil aviation. Freight expansion was also the biggest ever, with ton-miles flown rising by 560 m. or 14 per cent to reach a new peak of 4.570 m.

Among significant aspects of the 1967 statistics were that about 80 per cent of the traffic was carried by turbo-jet aircraft and that the average speed of travel reached 500 kilometres per hour.

In the ten-year period from 1958 to 1967, the average annual rates of growth in the air transport industry have been 12 per cent for passengers, 14 per cent for passenger-miles flown and 17 per cent for freight ton-miles.

Basis of International Trade

Internal trade refers to the exchange of goods and services within the geographical boundaries of a nation. International trade, on the other hand, refers to the trade or exchange of goods and services between two or more countries. The simple reason for trade—whether between individuals or between regions within a country or between countries—is that it enables people to enjoy those goods and services which they cannot produce themselves or produce only at a comparatively higher cost. Foreign goods are bought if they are cheaper than home produced goods of equivalent quality. It may, therefore, be argued that basis of international trade is the difference in money prices. A more fundamental explanation for international trade is, however, found in the difference in relative prices—that is, differences among nations in the value of a product measured in terms of other products. A country exports that product in which it has a comparative advantage and imports that product in which it has a comparative disadvantage. Although many conditions favour or hinder international trade, foreign trade has rested fundamentally on the basis of irregular distribution of natural resources and on the ability of people to use technology in their development.

Basis of International Trade

In general, international trade is the result of a combination of conditions, though one or a few conditions may be primarily responsible for the international movement of some goods. Countries differ so greatly in mineral resources, climate, natural vegetation, soils, etc. that foreign trade rests basically on the differences in physical geographic conditions.

In the first place, we may emphasise the importance of mineral resources and international trade. Some countries are rich in minerals but some are not so. Japan started an iron and steel industry at one time by using domestic iron ore, charcoal and later coal. But the modern Japanese iron and steel industry depends for most of its iron ore, coal, etc. on imports from India and many other countries. Argentina has very little of iron ore

or good quality coal but it has a modern integrated and steel industry based on imported high grade iron ore, coal, alloy minerals, etc. The blast furnaces of the United Kingdom and West Germany make use of high grade imported ores. These examples will be sufficient to illustrate the relation of mineral deposits in international trade. At present the tonnage of minerals moving in international trade ranks high among all products.

Secondly, the uneven distribution of power resources is responsible for the movement of commodities between countries. Countries with plenty of power resources tend to become industrial nations of the world. Good examples are the United States, the United Kingdom, Belgium and West Germany. These countries import raw materials from many countries, manufacture finished products and export them to different parts of the world.

Thirdly, differences in climate, soil and natural vegetation provide a basis for international trade in many products. A good example is the trade between tropical and temperate lands. For instance, sugar is produced in cane plantations in tropical countries and is shipped to countries in the temperate zone. Likewise, cotton, jute, tobacco, bananas and many other products are produced in tropical areas and shipped to countries in temperate regions. In contrast to the above, wheat is produced in temperate regions and is transported to tropical areas. The countries with mediterranean climate have developed large commercial fruit and vegetable industries and they dominate world exports of grapes, raisins, wine, olive oil and citrus fruits. Thus differences in rainfall and temperature have been responsible for much of international trade.

Fourthly, differences may exist between countries in the matter of capital, efficiency of labour and technology. By virtue of experiencing industrial revolution in the first instance, England enjoyed a superiority over many others in the manufacture of machinery and equipment. At present, advanced nations like the United States, West Germany and Japan are able to specialise in the production and export of machinery, equipment, and many types of consumers goods.

Thus, why trade takes place between two or more countries is explained by the fact that they differ in the possession of various factors of production. Each country tends to specialise in the production of those goods in which it has advantage and exports part or whole of them. It tends to import those goods for which it does not have adequate or efficient resources.

Conditions Affecting International Trade

Besides physical geographic conditions, international trade is influenced by such considerations as the stage of economic development, the wealth of a people, foreign investment, political relations, trade and financial regulations of the government, international trade agreements, etc. It is possible that one or

more of these points may be dominant and influence the volume and character of international trade and often may override the importance of differences in physical conditions.

Stage of Economic Development—Backward peoples produce and trade little. For instance, the Eskimos, the natives of New Guinea, the forest Indians of eastern Ecuador and such other primitive peoples carry on very little trade, either among themselves or internationally. Economically advanced people tend to produce more and, therefore, trade more. Economic development greatly accentuates the transfer of commodities. For example, the United States of America, the United Kingdom, West Germany and Japan which are technologically advanced nations of the world, buy foodstuffs, raw materials, semi-manufactures and manufactures from most parts of the world. It is, thus, clear that the stage of economic development greatly helps to increase the total volume of trade.

Wealth of the People of a Nation—In the most technically advanced nations, people have very high per-capita income and, therefore, purchasing power. People with a high per-capita income readily spend money not only for the bare necessities, but also for conveniences and luxuries. Household equipment, cosmetics, radios, television, cars, etc. are produced extensively and exported. These entail the import of necessary raw materials, and semi-manufactures from other countries. On the other hand, peoples of Asia, Latin America and Africa have low per-capita income and, therefore, have low purchasing power. Naturally, these people do not have the money with which to buy a great variety of products. Per-capita foreign trade in many of these countries is extremely low indeed, as for instance, 10 in India, 12 in Laos, 18 in Pakistan and Indonesia, and so on. Thus, the volume of international trade of country depends upon the level of income and wealth of a country.

Foreign Investments—One of the important features of economic development has been the large volume of foreign investments. Most of the oil fields of Latin America, the Middle East, South Eastern Asia and Northern Africa were developed by the giant petroleum companies of America and England. The railways of India, Africa, Latin America were built primarily by European and American capital for bringing commodities from the interior points for export. Foreign capital was also responsible for the setting up of sugar and banana plantations in tropical islands and tea and coffee estates in India. Likewise, foreign capital has been responsible for the exploitation of iron ore, tin, copper, lead, zinc, and other minerals in Africa, South America and Asia. It may be observed that such large investments were made by corporations of industrial nations such as England, U.S.A., Japan and others mainly to obtain necessary raw materials. Foreign investment has led to two-way trade, viz., the export of raw materials by the

under-developed and developing countries and the import of machinery, equipment and even foodstuffs from advanced industrial nations. Moreover foreign capital has not only been flowing steadily between advanced and underdeveloped economies but also between developed nations. Recently, American capital has been flowing in large quantities to European countries. Thus, international investments have been responsible for rapid economic development and for increasing international trade.

Trade and Financial Regulations—International trade is always influenced by the commercial policies and financial regulations of governments. At one time, governments used taxes on exports and imports to influence and control the volume of trade. Such taxes were known as customs duties. They were levied either to collect revenue for the State or to help local industries against foreign competition. For instance, import duties were levied to raise the price of foreign goods and thus give a price advantage to the locally produced goods ; this method has been known as protection. Apart from the use of customs duties, modern governments have been using other direct quantitative methods, such as the system of licensing, import quotas, etc. By using these methods, the government can prevent or restrict the import of particular goods from foreign countries. Again, since the 1930's many governments have been using exchange controls to restrict the movement of goods between countries. For instance, the Indian Government has strict exchange controls under which importers have to get the necessary foreign exchange from the Reserve Bank of India (and if the latter refuses, imports can not be made) and exporters have to surrender the foreign exchange earned by them to the Reserve Bank of India. Thus, international trade is influenced directly by the use of tariffs and other trade regulations, exchange controls, etc. After the First World War and particularly during the great Depression of 1929-33, most countries of the world adopted many of the restrictive policies and thus reduced the volume of international trade. It was only after the Second World War that countries felt the need for the reduction of tariff restrictions. A General Agreement on Tariffs and Trade (G.A.T.T.) was concluded and countries agreed on tariff reductions on a broad scale and on a code of rules for conducting international trade.

Political Alliances—An important factor which influences the trade between countries is the political relationship and political alliances. In a way, political alliances can influence international trade in a manner which no other factor can do. Let us give some examples to illustrate this point. India was part of the British Empire before Independence in 1947 and is now a member of the British Commonwealth of Nations. So much so, at one time, over 70 per cent of India's trade was with Britain and the Commonwealth countries. Even now, about 27 per cent of Indian's trade is with the United Kingdom. There was very little trade

between the United States and the Philippines before 1898. In that year, Philippines came under the rule of the United States and since then (till 1947) a large proportion of the trade of Philippines was with the United States, the mother country. Again, Puerto Rico's trade is with the United States, because of its intimate political alliance with the latter. Eastern European countries, Cuba and others have political alliances with Soviet Russia and accordingly their international trade is mainly with Communist Countries. International trade is also influenced by the formation of economic and currency blocs. The setting up of the European common market has helped to promote trade between member countries.

Other Factors Affecting International Trade—International trade is influenced strongly by the customs and habits of the people. For instance, extensive trade in tea, coffee, tobacco etc. is directly due to the habits of drinking and smoking. International trade in these commodities is increasing despite high prices, stiff import duties, etc. In this connection, we may mention the importance of advertising which is a powerful force in the flow of trade. For instance, India has set up many special boards and bureaus for the promotion of her exports of jute goods, tea, coffee, tobacco, etc. Likewise, many countries are doing extensive advertisement in countries like U.S.A. which are big buyers of consumer goods. Again, international institutions such as the International Monetary Fund, the World Bank and the Export-Import Bank have helped in economic development of nations and, therefore, have raised the volume of their exports and imports.

We may now sum up the basis of international trade and the factors which influence it. International trade takes place because countries find it beneficial to import and export. The main cause for this is the differences in factor endowment and technology. Every country specialises in the production of those products in which it has comparative advantages and exporting part of them, it imports those goods in which it has comparative disadvantages. Differences in factor endowment are thus the basis of international trade. However, there are many other factors which help or hinder the flow of trade between countries. We have mentioned such factors as the stage of economic development, the level of income and wealth of a nation, the level of foreign investment, political alliances, establishment of international institutions, etc.

The Comparative Cost Principle

In the field of international trade we attempt to answer three questions :

- (a) Why do countries enter into trade with each other ?
- (b) On what basis, each country specialises in the production of some goods ? and
- (c) What forces govern the terms on which countries exchange and trade with each other ?

Ricardo was the first economist to answer the above three questions with the help of the principle of comparative advantage. His theory was later modified and improved by such well-known economists as J.S. Mill, Taussig, and Haberler. In simple terms, the principle of comparative advantage states that every country produces those goods in which it is particularly suited on account of its climate, the qualities of its other natural resources, the efficiency of its people, its plant and equipment etc. ; and by exporting part of these goods, it imports those goods in which it is less suited to produce or which it cannot produce at all. In other words, every country produces and exports those goods in which it has cost advantage and it imports those goods in which it has cost disadvantage.

The assumptions of the principle of Comparative Advantage

The principle of Comparative advantage is based on the following assumptions :

- (i) Labour is the only productive factor and cost of product consists of only labour costs which are expressed as certain days or certain units.
- (ii) All labour units are assumed to be homogeneous.
- (iii) Production is subject to the law of constant returns or costs, i.e. cost ratios between two goods are assumed to be constant.
- (iv) Only two countries and two commodities are to be considered at any time.
- (v) Factors of production are perfectly mobile within the country but immobile between the countries.

- (vi) Transportation charges are ignored.
 (vii) International trade is free from all obstacles and barriers.

(viii) Trade takes place between two countries of equal economic strength and in two commodities of equal economic value.

Let us explain precisely the meaning of comparative cost advantage by taking two countries and two commodities. We shall consider India and Burma and rice and cotton. We can distinguish three types of cost differences, viz, equal cost differences, absolute differences in cost and comparative differences in cost.

Equal Differences in Cost : The following schedule illustrates equal differences in costs.

In India

Ten days of labour can produce 80 units of cotton.

Or

50 units of rice.

In Burma

10 days of labour can produce 60 units of cotton.

Or

45 units of rice.

In this example we have taken 10 days of labour in both the countries, to illustrate that production is based on labour and that the same number of labour units can produce different quantities in the two countries because of the differences in natural and other factors. In India 10 days of labour can produce either 80 units of cotton or 60 units of rice. The cost ratio between cotton and rice in India is 80:60 or 4:3. In Burma the same ten days of labour can produce either 60 units of cotton or 45 units of rice and the cost ratio between cotton and rice is 60:45 or 4:3. It is clear that the cost of producing cotton in terms of rice is the same in both the countries. This is what is known as equal differences in cost of production. Neither country has any superiority over the other in the production of any of the two goods. We can express this idea in another way: The ratio of cost of production of cotton in both the countries is

$$\frac{80 \text{ units of cotton in India}}{60 \text{ units of cotton in Burma}}$$

is equal to the ratio of cost of production of rice in both the

$$\text{countries—} \frac{60 \text{ units of rice in India}}{45 \text{ units of rice in Burma}}$$

When cost ratios are equal in both the countries, there is no scope for international trade because there is no gain for either of

the countries. Suppose India exports 20 units of cotton to Burma in exchange for rice. India will be able to produce 15 units of rice within the country by using those factors which produce 20 units of cotton. India, therefore, will be prepared to export 20 units of cotton only if it can get more than 15 units of rice from Burma. But India will not succeed in this. For Burma too has the same cost ratio viz. 20 units of cotton or 15 units of rice. Burma will be prepared to buy 20 units of cotton but will be prepared to pay less than 15 units of rice. The problem therefore, is :

For 20 units of cotton, India wants *more than* 15 units of rice.

For 20 units of cotton, Burma is prepared to give *less than* 15 units of rice.

It is thus clear that there is no scope for trade between India and Burma because the cost ratios of production are the same in both the countries.

Absolute Differences in Costs—Absolute differences in costs arise when a country can produce a commodity at an absolutely lower production cost than the other. We can give an imaginary example to illustrate absolute differences in costs as follows :

In India

10 days of labour can produce 100 units of cotton.

Or

50 units of rice.

In Burma

10 days of labour can produce 25 units of cotton.

Or

100 units of rice.

In this example India has an absolute advantage over Burma in the production of cotton. India's superiority in the production

of cotton is seen by the fact that $\frac{100 \text{ units of cotton in India}}{25 \text{ units of cotton in Burma}} >$

$$\frac{50 \text{ units of rice in India}}{100 \text{ units of rice in Burma}}$$

Just as India has a superiority in the production of cotton, Burma has a superiority over India in the production of rice. These differences in cost of production naturally indicate that both countries will benefit through trade. If there is no trade, India will have to produce some amount of rice for which it has no proper facilities, i.e. some of the labour and other factor units which can produce cotton will have to be used to produce rice. Likewise, in the absence of trade, Burma will be forced to

produce cotton for which it has no facilities. On the other hand, if international trade takes place, India can specialise in the production of cotton and Burma in the production of rice. Specialisation by each country will lead to an increase in total output for both cotton and rice. Besides both countries will benefit through trade. For instance, India will be happy to export cotton so long as it can get more than half a unit of rice for a unit of cotton, (this is the cost ratio within India). Burma on the other hand, will be prepared to import cotton and exchange as much as four units of rice for a unit of cotton. Hence, the trade between the two countries will be very beneficial to both at any rate between half to four units of rice for one unit of cotton. We, therefore, come to the conclusion that international trade will definitely take place under conditions of absolute differences in costs. But then it is not always easy to come across countries having absolute differences in costs of production. It is just sufficient to have comparative differences in costs between countries.

Comparative Differences in Costs—Comparative differences in cost imply that one of the two countries has an absolute advantage in the production of both the commodities, but its comparative advantage is greater in the production of one commodity than in the production of the other. Let us illustrate this point with the help of an example, as follows :

In India

10 days of labour can produce 100 units of cotton.

Or

100 units of rice.

In Burma

10 days of labour can produce 40 units of cotton.

Or

80 units of rice.

In this example, India has absolute advantage in the production of both the goods since it can produce both cotton and rice at a lower cost as compared to Burma. But India's advantage is comparatively greater in the production of cotton than in rice. This is clear from the fact :

$$\frac{100 \text{ units of cotton in India}}{40 \text{ units of cotton in Burma}} > \frac{100 \text{ units of rice in India}}{80 \text{ units of rice in Burma}}$$

In the case of production of cotton, India's advantage over Burma is $\frac{100 \text{ units of cotton in India}}{40 \text{ units of cotton in Burma}}$, or 2.5 times. In the case of production of rice, India's advantage over Burma is given by the

fact $\frac{100 \text{ units of rice in India}}{80 \text{ units of rice in Burma}}$ or 1.25 times.

This means that India is superior to Burma in the production of both the commodities, but its superiority is *comparatively* higher in the case of cotton than in rice. In other words, if there is no trade between the countries, India will have to produce both the goods, but in case trade takes place, India will find it better to specialise in the production of cotton in which it has greater advantage in production.

On the other hand, Burma has a disadvantage in the production of both the goods, but its disadvantage is less in the case of rice. For instance, the position in the case of cotton, as far as Burma is concerned is :

$\frac{40 \text{ units of cotton in Burma}}{100 \text{ units of cotton in India}}$ or $\frac{2}{5}$ or 0.4

The position in the case of rice, as far as Burma is concerned is :

$\frac{80 \text{ units of rice in Burma}}{100 \text{ units of rice in India}}$ or $\frac{4}{5}$ or 0.8

It is, thus, clear that Burma has less disadvantage in rice than in cotton or put it in a reverse way, Burma has a greater comparative advantage in the production of rice than in cotton. If there is no trade between India and Burma, the latter will be compelled to produce both goods. In case, international trade takes place, Burma can concentrate and specialise in the production of rice in which it is better placed comparatively.

International trade is good for both the countries as is clear from the above example. For instance, the cost ratio of production of cotton in terms of rice in the countries are :

In India : 100 units of cotton = 100 units of rice
Or 1 unit of cotton = 1 unit of rice

If India has to specialise in cotton and export it to Burma in exchange for rice, India will do so provided it can get *more than one unit of rice* for every one unit of cotton exported.

In Burma : 40 units of cotton = 80 units of rice
Or 1 unit of cotton = 2 units of rice

If Burma has to specialise in rice and export it to India in exchange for cotton, Burma will do so, if it can get one unit of cotton for *less than 2 units of rice exported* (or what is the same thing, Burma should get more than one unit of cotton for every 2 units of rice exported). Thus, for every unit of cotton, India wants more than one unit of rice, but Burma is prepared to give upto 2 units of rice. International trade will definitely take place and both parties stand to gain from trade. What will be gain or benefit from trade for the two countries? This will depend upon the

actual terms of trade or the rate of exchange between the two countries. We have shown that the cost ratios of production are

India : 1 unit of cotton	=1 unit of rice
Burma : 1 unit of cotton	=2 units of rice
<i>Terms of Trade</i> : 1 unit of cotton	=1 unit of rice to 2 units of rice

The actual *terms of trade* at any particular time will lie between the two rates ; the lower rate of 1 unit of rice for every unit of cotton will be for India ; and the higher rate of 2 units of rice for every unit of cotton will be for Burma. Suppose, after bargaining, the actual rate of exchange between the two countries is established at 1.5 units of rice for every unit of cotton. India will gain by 0.5 units of rice for every one unit of cotton—this is a gain of 50 per cent. On the other hand, Burma will gain by 0.5 units of rice for every unit of cotton—this is a gain of 25 per cent for Burma. The actual terms of trade will depend upon mutual demand.

We started our discussion by posing three questions. We have answers for all the three questions :

(a) When will international trade take place ? Trade cannot take place if the differences in cost of production are the same or equal in both the countries. Trade is bound to take place if there are absolute differences in cost, but this is not necessary. It is just sufficient, if there are comparative differences in costs of production.

(b) If trade takes place, in what commodities each country will specialise ? Every country will specialise and concentrate in the production of that commodity in which it has comparatively greater advantage.

(c) How will the terms of trade be determined ? The terms of trade will be determined by forces of mutual demand between the two countries for the two commodities but within the opportunity cost ratios of production.

This is, in substance, the principle of comparative advantage in international trade. A little consideration will show that this principle does not apply exclusively to international trade. As the famous Swedish economist Bertil Ohlin has pointed out, this principle is at the bottom of all trade, whether it is specialisation and exchange between two individuals or between different districts of the same region, or between different regions of the same country or between different nations. The source of all trade is the same viz., the relative or comparative advantage enjoyed by one producer in the production of a commodity or service as compared with another.

The Theory of Comparative Cost expressed in terms of Money

In the above analysis we have followed Ricardo by assuming that labour alone is responsible for production and that labour cost constitutes the cost of production. In a modern money economy, where there is a high degree of division of labour, goods are bought with money. International trade is not, therefore, determined by comparative differences in labour cost but by absolute differences in money prices. But it is easy to translate comparative cost differences into absolute differences in money cost and prices. For this purpose, let us take the third example we have given above, viz.,

In India

10 days of labour can produce 100 units of cotton

Or

100 units of rice

In Burma

10 days of labour can produce 40 units of cotton

Or

80 units of rice

In this example, India has an absolute advantage over Burma in the production of both the goods but she has a comparative advantage over Burma in the production of cotton. Burma, on the other hand, has comparatively less disadvantage in the production of rice than in cotton. When international trade takes place, India specialises in the production of cotton and Burma in rice. Let us now convert this arithmetical example into money terms, by assuming that daily wages in India and Burma are Rs. 6 and Rs. 4 respectively.

<i>Country</i>	<i>Daily wage</i>	<i>Total wages</i>	<i>Total output</i>	<i>Money cost or supply price per unit in Rupees</i>
India	Rs. 6	Rs. 60	100 units of cotton	0.60
			100 units of rice	0.60
Burma	Rs. 4	Rs. 40	40 units of cotton	1.00
			80 units of rice	0.50

In the above table it will be noted that the money cost of production of cotton is lower in India as compared to that in Burma—in India it is 60 paise per unit, while in Burma it is Re. 1.00. per unit. The money cost of production of rice, however, is lower in Burma as compared to India. India will thus specialise in the production of cotton and Burma in rice. This result, it should be noted, is in harmony with the theory of comparative advantage which we have explained earlier in terms of labour cost.

Criticism of the Principle of Comparative Advantage

Till recently, the classical theory of international trade, known as the principle of comparative cost advantage, was the most generally accepted explanation of the phenomenon of international trade. But the theoretical structure of the principle has been quite shaky even for the beginning because of its weak foundations. In recent years it has come in for many severe criticism at the hands of the Swedish economist Bertil Ohlin and American economist Frank Graham. Let us consider some of the important criticisms.

(i) *The assumption of labour cost is unrealistic*—A basic criticism against the theory is against its assumption of labour cost to explain domestic exchanges of goods. Even in the 19th century itself, the labour theory of value was given up because of (a) the existence of non-competing groups of labour, (b) the necessity to include different grades of labour and (c) the addition of other factors of production such as capital, land and enterprise. The labour cost approach to explain the value and price of goods both in domestic as well as international trade has been given up. It is further pointed out that money cost alone will serve as the best basis of comparison. The critics, therefore, have argued that the labour cost approach should be given and that problem of international trade should be analysed in terms of prices, since it is prices that determine what goods will enter into international trade and which country will produce them.

(ii) *The assumption of constant cost of production is not realistic*. The principle of comparative advantage is based on the assumption that production is subject to the law of constant costs and that additional quantities of any commodity can be produced within the same expenditure of labour per unit as before. In our last example, the cost ratios between cotton and rice are 1 unit of cotton=1 unit of rice in India and 1 unit of cotton=2 units of rice in Burma. Under the assumption of constant costs, these cost ratios in the two countries will be the same, whatever be the degree of specialisation. In practice, however, the law of diminishing returns prevails in all lines of production and, therefore, additional quantities can be produced only at an increasing cost per unit. What will happen when production is subject to the law of diminishing returns or increasing cost?

When India specialises in cotton, it may be forced to bring into cotton production, lands and other factors less suitable to cotton production but more suitable to rice. Thus, the cost of production of cotton in India will increase in terms of rice. The opportunity cost ratio between cotton and rice in India will rise as follows :

1 unit of cotton	=	1 unit of rice
	=	1.2 units of rice
	=	1.4 " "
	=	1.6 " "
	=	etc.

Conversely, in Burma, the cost of production of rice may increase in terms of cotton, when Burma proceeds to specialise in rice, as a result of international trade. Land and other factors less suitable for rice but more suitable for cotton will be brought under cultivation of rice in Burma. The cost of production of rice in terms of cotton consequently will rise as follows :

1 unit of cotton	=	2	units of rice
	=	1.8	units of rice
	=	1.6	" "
	=	1.5	" "
	=	1.4	" "
	=	etc.	

Thus, after specialisation has proceeded a certain stage and cost ratios also have changed considerably in both the countries, a stage is reached when the cost ratios in both the countries become more or less equal, say at one unit of cotton=1.5 units of rice. But as we have shown already, under conditions of equal differences in cost, there can be no international trade since neither of the countries stands to gain. Further specialisation will have to stop and India and Burma will have to produce both the commodities. Thus, the law of diminishing returns or increasing costs is an important limitation on the application of the principle of comparative advantage.

(iii) *The assumption regarding the mobility of factors is wrong*—According to the classical school of economics, factors of production are perfectly mobile internally, but they are absolutely immobile internationally. This supposition is unreal and does not accord with facts. There is no perfect freedom for the movement of different factors either between industries or between regions within a country. This is clear from the existence of different wages and interest rates in different occupations and regions. Besides, labour and capital do not move out easily from a depressed industry to other industries. Adjustments do take place but only slowly and for a considerable period of time, the immobility of factors significantly affects prices and through them the course of international trade.

(iv) *The assumption that transport cost should be ignored is also unrealistic*—An important limitation to the principle of comparative advantage is implied in the assumption that transport cost should not be considered. There are many lines of production in which cost of transport is higher than production cost. A commodity cannot be exported or imported unless the differences in the cost of production between the countries exceeds the cost of transporting it from one country to another. The presence of transport costs leads to a third type of commodity viz., domestic goods, in addition to export and import goods. An easy way to overcome this difficulty is to include transport costs along with production costs.

(v) *Existence of transport costs poses another problem too—* Many examples may be given to show how one part of a country may import a commodity while another part of the same country may produce and even export it. German port towns were long accustomed to import coal from England, even though Germany itself was a leading producer of coal in Europe. This was due to the fact that the German ports were nearer to England and the cost of transporting coal from the latter through the sea was much cheaper.

(vi) *There are practical difficulties to complete specialisation.* Frank Graham has proved clearly that complete division of labour would be impossible even on the assumptions of the classical writers. If we consider two countries, one small and the other large (Burma and India, in our example), it may be possible for the former to specialise completely in the production of one goods while the latter have to produce both goods. In our example, Burma which has special advantage in the production of rice will concentrate in the production of rice and export its surplus to India, to pay for its import of cotton. On the other hand, India being a large country cannot specialise in the production of cotton for two reasons :

(a) Burma cannot buy all the surplus cotton which India can supply;

(b) Burma being a small country cannot meet fully India's requirements of rice.

It is, thus, clear that a small country can go for complete specialisation but a large country cannot afford to do so. In this sense, the principle of comparative advantage has definite limitations.

A similar incomplete specialisation comes into existence when we consider two commodities not of comparable value but one having a high value and the other a very low value. It is possible for the country producing a high value commodity to specialise but it will not be possible for the other country producing a low-value commodity to specialise. Frank Graham remarks : "The classical conclusion of complete specialisation between two countries can hold ground only when the rice is loaded by assuming trade in two commodities of approximately equal consumption value and between two countries of approximately equal economic importance." These conditions are rarely fulfilled in real world and hence the classical theory of comparative advantage is not realistic.

(vii) *Strategic considerations may limit the application of the principle of comparative advantage—*An important limitation of the principle of comparative advantage may arise as a result of a deliberate attempt on the part of a government to produce a particular commodity, even though (a) the country does not have

the natural and other resources to produce it, and (b) it may be possible to import the commodity cheaply from some other country or countries. Certain commodities may be regarded as very essential from the point of view of defence and they will have to be produced whether the country has facilities for their production or not. India is producing raw jute in Orissa and in some other parts of the country, even though Pakistan has almost a world monopoly of raw jute ; India's production of raw jute is to prevent our dependence on Pakistan.

(viii) *Inadequate resources may limit the full application of the principle of comparative advantage*—A country like India may have very good resources and, therefore, advantage in the production of a commodity, say cotton. India may actually be a leading producer of cotton. But the internal production may not be adequate for satisfying the domestic demand. In such a case India will be forced to import cotton, even though it has advantage in its production.

Some writers have tried to show that the comparative advantage principle does not apply to a country which imports one variety of a commodity while it produces and exports another variety of the same commodity. In fact, this is no limitation at all. In economic analysis, each variety is considered a separate product. India may have considerable cost advantages in the production of coarse and medium varieties of cloth but no advantages at all in the production of superior or finer varieties. It is, therefore, natural for India to export the former and import the latter.

(ix) *The principle of comparative advantage is a clumsy and dangerous tool of analysis*—Bertil Ohlin has criticised the principle as cumbersome and unrealistic because it does not straight away consider the complete cost differences in the different countries. It does not examine as to what extent the cheapness of production in one country is due to low wage, low interest, low transportation and other expenses. On the other hand, the principle considers and compares only the cost of labour in the two countries leaving out all other cost items. Ohlin considers the classical approach dangerous because it considers specifically only two countries and two commodities but extends its conclusions uncritically and unhesitatingly to actual situations which are complex involving several countries and numerous commodities.

To conclude, the principle of comparative advantage attempts to show why trade takes place between countries, how countries specialise in different commodities and the terms of trade are determined. But the principle has come in for severe criticism in the hands of modern economists on the ground that it is based on unrealistic assumptions. Bertil Ohlin and many others have argued that the principle of comparative advantage is not the basis of international trade but is the basis of all trade

and exchange, whether it is between individuals or two regions in a country or between two countries. In a general way, each trading country exports those goods which it produces at lower opportunity costs and imports those goods which it produces at higher opportunity costs than other countries. Now those commodities which a country can produce at lower opportunity costs, are those which require for their production much of the abundant factors and little of the scarce factors ; while commodities produced at higher opportunity costs are those which require much of the scarce factors and little of the abundant factors.

CHAPTER XIX

The Terms of Trade

In the last chapter we mentioned the concept of terms of trade to refer to the rate at which cotton exchanged for rice between India and Burma. In this chapter, we shall explain clearly and more elaborately the meaning of "terms of trade", the different concepts of terms of trade, their measurement, their significance and so on.

1. TERMS OF TRADE—MARSHALL EDGEWORTH ANALYSIS

Terms of trade refer to the rate at which a country's exports exchange against its imports or they refer to the relationship between the prices a country gets for its exports and the prices it has to pay for its imports; as such, they express the relation between two sets of world prices. We can take a simple numerical example to explain the terms of trade for two countries and two commodities, assuming constant costs of production. We reproduce below the illustration of comparative cost advantage given in the previous chapter.

In India

10 days of labour can produce 100 units of cotton

Or

100 units of rice.

In Burma

10 days of labour can produce 40 units of cotton

Or

80 units of rice.

The opportunity cost ratio of production in India is 1 unit of cotton=1 unit of rice. In Burma the opportunity cost ratio is 1 unit of cotton=2 units of rice. In case international trade takes place between India and Burma, the terms of trade will be determined by the opportunity cost ratios, the actual rate, of course, depending upon India's demand for Burmese rice and Burmese

demand for India's cotton. These terms of trade can also be illustrated with the help of a figure as follows :

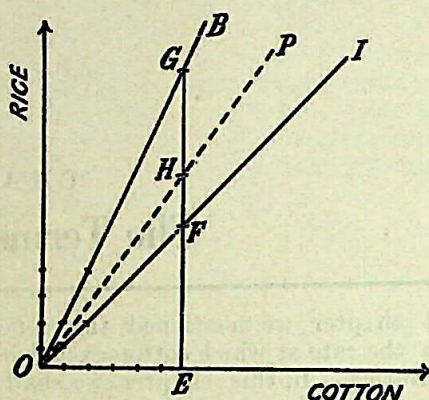


Fig. 46

In the above figure the OX axis represents cotton and OY axis represents rice. We have drawn the opportunity cost ratio line for India (OI) and this line has been prepared by taking one unit of cotton against one unit of rice. The opportunity cost ratio line for Burma (OB) has been drawn on the basis of 1 unit of cotton and 2 units of rice. The opportunity cost ratio lines are straight lines because of our assumption of law of constant costs. The terms of trade between cotton and rice between India and Burma are determined by the mutual elasticities of demand and they are represented by the dotted line OP in the above figure. In the absence of trade, both countries will have to be satisfied with their opportunity cost ratio lines. But when trade takes place, the terms of trade represent an advantage for both of them. (India's gain is FH and Burma's gain is HG). It is, therefore difficult to say whether the terms of trade are favourable or unfavourable because the terms of trade line OP represents gain for both the countries.

The diagram on the next page gives essentially the same analysis, but on the basis of the law of diminishing returns or increasing cost. In this figure, the opportunity cost ratio lines have been replaced by what are known as offer curves. The offer curve of India represents the units of cotton which India will be prepared to offer for rice. Upto a certain point, India may be willing to accept one unit of rice for a unit of cotton; but beyond a certain stage, India demands more than one unit of rice for every unit of cotton exported. On the other hand, Burma is willing to offer 2 units of rice for a unit of cotton; but after a certain stage she is willing to offer less than 2 units of rice. What is the reason for this?

As pointed out in the previous chapter, production is subjected to the law of diminishing returns or increasing cost. When

India specialises in the production of cotton, the cost ratio of

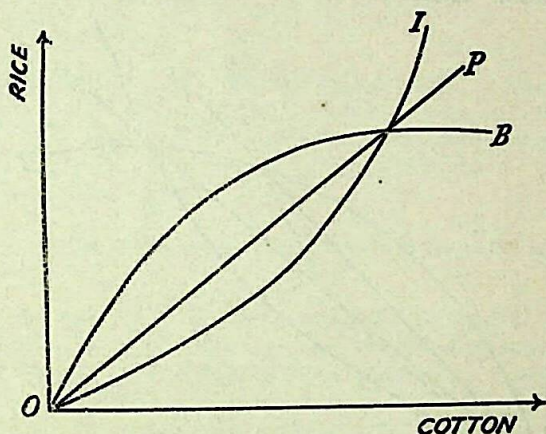


Fig. 47

producing cotton in terms of rice increases, as shown below :

1 unit of cotton	=	1 unit of rice.
	=	1.2 unit of rice.
	=	1.4 unit of rice.
	=	1.6 unit of rice, etc.

As the opportunity cost ratio of production of cotton rises, India will naturally demand a higher price for cotton from Burma (in terms of rice). It is for this reason that India's offer curve is sloping upward and is not a straight line. A similar argument holds good for Burma.

In the above figure the terms of trade line is given by line *OP*. This line shows how both the countries will benefit from trade but it does not show whether the terms of trade are more or less favourable. On the other hand, a rise in the terms of trade as in Fig 47 reflects an improvement in the terms of trade for one country. In the diagram on the next page the higher terms of trade are represented by *OP''* and are due to India's reduction of demand for Burmese rice. This is a favourable shift to Burma. A shift in the opposite direction would be favourable to India.

So far we have explained the terms of trade as originally developed by Marshall and Edgeworth. This analysis is extremely unrealistic and vague. For one thing, the analysis is based on the assumption of two countries and two commodities, but in practice, more than two countries and hundreds of commodities are involved. Secondly, the theory assumes that imports and exports are always balanced ; this, in fact, is not true. Finally,

it is not known what would be the prices, in the absence of international trade. Hence several concepts of terms of trade have

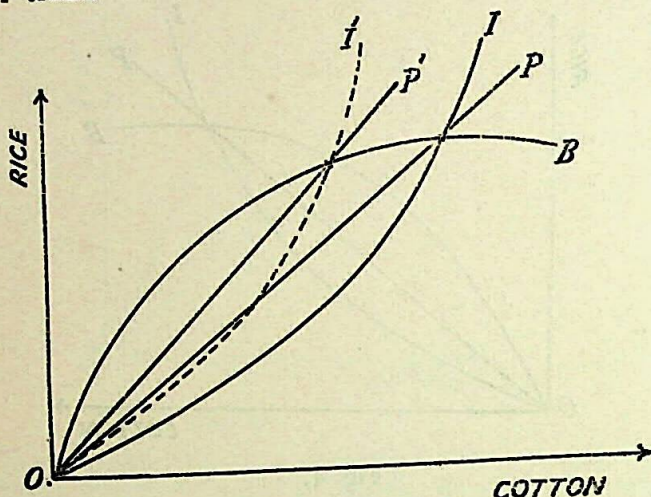


Fig. 48

been developed, the most important being net and gross barter terms of trade, and single factorial and double factorial terms of trade. We shall describe these concepts briefly here.

2. NET AND GROSS TERMS OF TRADE

Net barter terms of trade take into consideration the exports and imports of all goods and services between one country and all other countries in the world. They refer to the ratio of export prices to import prices at a given period as compared to an earlier base period. In algebraic form, the net barter terms of trade are :

$$\frac{PE_1}{PI_1} : \frac{PE_0}{PI_0}$$

where P stands for price

E	„	exports
I	„	imports
0	„	base period
1	„	subsequent period

More clearly, the net barter terms of trade are given by the formula :

Net barter terms of trade

$$= \frac{\text{Index number of export prices}}{\text{Index number of import prices}} \times 100$$

Suppose the prices of exports have increased by 20 per cent, but the prices of imports have gone up by 50 per cent. The net barter terms of trade will be :

$$\frac{120}{150} \times 100 = 80$$

The net barter terms of trade has fallen to 80 ; a decline below 100 is unfavourable. On the other hand, if the export prices have gone up by 50 per cent and the import prices have gone up by 20 per cent only, the net barter terms of trade will be :

$$\frac{150}{120} \times 100 = 125$$

The net barter terms of trade have risen to 125 ; a rise above 100 is favourable.

From what we have explained above, the method of calculating the net barter terms of trade, we may think that the concept is quite significant in a study of the relationship between international trade and level of real income in a country. Actually, net barter terms do not say anything of what has happened to the balance of payments. For instance, from an improvement in the terms of trade, we cannot say, whether—

- (a) exports and imports remain balanced,
- (b) less exports are being exchanged for the same imports,
- (c) the same amount of exports bring in more amount of imports,
- (d) exports exceed imports but the surplus is invested in foreign countries.

It is even possible that there is a balance in the subsequent period but a deficit at the base period. In other words, the concept of net barter terms of trade of a country is vague and does not give us any precise idea about the nature of international trade of a country. It is to overcome these difficulties that Professor Taussig devised a new concept of terms of trade known as the "the gross barter terms of trade."

Gross barter terms of trade relate to the quantity of exports and imports exchanged for one another in a given period as compared with the base period. In algebraic form :

$$\frac{QE_1}{QI_1} : \frac{QE_0}{QI_0}$$

Quantities of exports and imports may be expressed in tons but this is misleading (for a ton of gold and a ton of coal are not obviously the same). Hence, it is better to use index number. The quantities are derived by dividing index number of values ($P \times Q$) by index number of price (P). The use of gross barter terms of trade is much more useful. Suppose, the balance of

payments is balanced when the net barter terms of trade had turned favourably from, say 100 to 125. This means that the rise in export prices was more than rise in import prices by 25 per cent. Since the balance of payments is balanced, this implies that the gross barter terms of trade will have declined numerically from 100 to 80. This is a favourable movement because with a smaller quantity of exports :

- (a) It is possible to import the same volume of imports,
- (b) A large volume of imports is being obtained for the same amount of exports,
- (c) or a little of both.

3. SINGLE FACTORAL AND DOUBLE FACTORAL TERMS OF TRADE

According to Professor Jacob Viner the net and gross barter terms of trade are not so useful. They are significant only if (a) the balance of payments are balanced in the two periods and (b) these two periods are close to each other to ignore large changes in productivity of factors. Accordingly, Professor Viner has devised two other concepts of terms of trade to take account of changes in productivity. These concepts are known as single factorial and double factorial terms of trade.

Single Factoral Terms of Trade are the prices of imports relative to the prices of exports adjusted for changes in the productivity of a country's factors in the production of exports. This concept is quite significant because single factorial terms of trade represents the rate at which the services of a country's factors are exchanged for goods from abroad. If export prices fall relative to import prices but if productivity efficiency increases a country is positively better off. This fact is not brought out by the net barter terms of trade.

Double Factoral Terms of trade take into account the changes in the productivity of a country's factors in the production of exports as well as the increase in the efficiency of foreign factors in producing import goods.

4. CAN A COUNTRY CHANGE ITS TERMS OF TRADE ?

A country can influence the terms of trade, or more precisely, improve its terms of trade, only if it can influence export and import prices. It can do so only under certain circumstances. If a country, because of certain natural and artificial factors, is able to contribute a significant portion of the volume of international trade, it will be able to influence international prices. At one time, England was in that position. It is also possible for one or a few countries to join together and secure a complete or near-monopoly either for exporting a particular item or for importing

it. In such a case too, world prices can be influenced. In practice, however, most countries cannot do so, as they are not important enough to turn the world prices in their favour and thus improve their terms of trade.

It may, however, be pointed out that even if a country can improve its terms of trade, it may not like to do so, as it will not be in its interest to do so. For example, if a country raises the prices of its exports (by restricting exports) and reduces the prices of its imports (by restricting imports), it will experience unfavourable results. Restriction of exports, for instance, will mean the loss of foreign markets to competitors and the necessity to import less of even the most essential items. Restriction of imports will entail loss of satisfaction to the local consumers. Thus, favourable terms of trade may be brought about by raising the prices of exports and reducing the prices of imports, but favourable terms of trade by themselves do not necessarily indicate that a country is better off.

5. EFFECTS OF CHANGES IN TERMS OF TRADE

It is very difficult to say whether any changes in terms of trade are good for a country or not even though the terms of trade might have moved in its favour.

If a change in the terms of trade is due to a change in demand the country whose exports are now demanded more strongly will gain. Suppose India's exports are primarily tea and cotton goods and the demand for them increases, naturally prices of India's exports rise. If the price of those goods which India imports rise less or do not rise at all, then clearly India can obtain more imports than before in exchange for a given quantity of tea and cotton goods.

A favourable change in the terms of trade of a country may not be in the interest of a country if it has been brought about by a higher cost of production of a basic material. It is possible that a particular mineral is getting exhausted slowly and, therefore, the cost of producing it rises. If this mineral is being exported, the export prices will rise and may lead to favourable terms of trade. But this does not mean that the country is benefiting for actually the country is becoming poorer because of the gradual exhaustion of a basic mineral resource.

On the other hand, an unfavourable change in terms of trade of a country may take place, as for instance, when the country has introduced some technological changes as a result of which the cost of production and the export prices have come down. Even though the terms of trade are not favourable to this country, it is definitely better off because of rise in real income due to greater productivity.

It will thus be clear that the effects of changes of terms of trade on national income and standard of living cannot always be stated in a positive manner.

Changes in terms of trade associated with a depression may or may not be beneficial depending upon the price of imports and exports and the nature of imports and exports. During the Great Depression of 1929-33, the terms of trade went against India, because of the heavy fall in the prices of agricultural and other raw materials which constituted India's exports and also because of the comparative stability in the prices of India's imports, consisting of machinery and manufactured goods. As a result, India suffered heavily during the Great Depression, while Great Britain, the chief exporter to India, was able to maintain a higher standard of living for the bulk of her population.

It should be noted, therefore, that a change in the terms of trade, favourable or unfavourable, does not help us to understand properly whether a country is gaining or losing; low prices of imports and high prices of exports do not necessarily mean that the country's economy is sound.

6. TERMS OF TRADE AND TECHNOLOGICAL PROGRESS

Since the last quarter of the 19th century, there has been a regular decline in the prices of primary products relative to the prices of manufactured goods. The terms of trade, therefore, have moved against underdeveloped countries producing and exporting primary products and in favour of advanced countries exporting manufactures. There are two points of view on this question.

In the first place, some have argued that the primary goods producing nations have not really suffered, for the decline in the prices of primary products has been due to technological progress. According to them, there has been considerable improvement in technology in the production of primary products. Accordingly, the quantities of factors required to produce a unit of a commodity is reduced and the cost of production has come down. This explains the fall in the prices of primary products. A fall in the price of these products (consequent to technological growth) reduces the quantity of imports which may be bought with a given volume of exports; in other words, the terms of trade has gone against the country producing primary products. However, technological progress also implies less number of factor units going into the production of the export products. Ultimately, the nation gives up in its exports the same volume of resources for its imports, as before. Hence, unfavourable terms of trade may not imply a reduction in the gain from trade for primary products nations, if it were attributable to greater technological progress in primary production than in manufacturing.

Some have given altogether different explanation. According to them, technological progress has been greater in manufacturing than in primary production. Prices of manufactures should have declined much more than primary products and that the terms of trade should have moved in favour of the primary producing nations. But the terms of trade have not moved in their favour because (a) the demand for primary products has risen at much lower rate than the demand for manufactures, (b) wages and other costs have tended to rise and remain at higher levels in manufacturing countries than in primary producing nations, and (c) the industrialised nations have appropriated to themselves the benefits of technical progress.

CHAPTER XX

Gains From International Trade

International trade is good for all the trading countries. It enables a country to import a commodity which it cannot produce or can produce only at a high cost. Further international trade makes it possible for a country to export a commodity and thus get a better market for it so that all the factors responsible for production may have higher incomes. It is interesting to observe that every country will benefit both as an importer as well as exporter. Just as trade and exchange are good for the seller and buyer, similarly international trade is a source of benefit for all the participating countries. It is for this reason that Adam Smith, the founder of the English classical school of economics, strongly advocated free trade between all countries and the complete removal of all obstacles to such free trade. Let us describe the general gains or advantages of international trade and also the share of each country in the gains from trade.

1. GENERAL GAINS

International specialisation—Just as internal trade and exchange lead to specialisation between individuals and regions, international trade enables to specialise in the production of those goods in which each country has special advantages. Each country or region is endowed with certain special facilities in the form of natural resources, capital and equipment and efficiency of human power. Some countries are rich in minerals and in hydro-electric power. Some are blessed with extensive land but have very little of population. Some others possess advanced techniques of manufacturing, a very efficient and hard working population and plenty of capital equipment. In the absence of trade, every country will be condemned to produce all types of goods, even those for which they have no facilities of production. International trade, on the other hand, will enable each country to specialise in the commodities in which it has absolute or comparative advantages. That is, the country which possesses plenty of land like Australia will produce wheat and meat and export them. Japan which has, very little of land but has an industrious population and plenty of capital equipment will produce all types of manufactures but will import goods in which it is deficient (particularly raw materials). England will export

manufactures (in which it has advantage) and import foodstuffs and raw materials. Thus, international trade brings about international specialisation and all the advantages associated with such specialisation.

Increased Production and Higher Standards of Living—It is well-known that specialisation leads to (a) best utilisation of the available resources, (b) concentration in the production of those goods in which there is advantage, (c) saving of time and energy in production and perfecting of skills in production, and (d) inventing and using new techniques of production. All these indicate one basic advantage, viz., increased production. That international specialisation can lead to increased production can be illustrated with the help of the example we have been using to illustrate the principle of comparative advantage. The example is as follows :

In India

X factors of production can produce 100 units of cotton
Or
100 units or rice.

In Burma

X factors of production can produce 40 units of cotton
Or
80 units of rice.

Let us assume that each country possesses 2 X factors. When each country produces both the goods, by using one X factor unit to produce each commodity, the total production comes to

Cotton	100	units in India
	+ 40	units in Burma
Rice	100	units in India
	+ 80	units in Burma
Total	<hr/> 320	units of both goods <hr/>

Suppose trade takes place between the two countries, as a result of which India is enabled to specialise in the production of cotton (in which it has greater cost advantage) and Burma in the production of rice (in which it has comparative advantage). The result will be as follows :

Cotton	200	units in India
Rice	160	units in Burma
Total	<hr/> 360	units of both the countries <hr/>

It is thus clear that total output will increase, if international trade takes place and this is a gain for both the countries. Increased

output will also mean higher standards of living for people in both the countries.

Equalisation of Prices Between Countries—An important gain of international trade—or the effect of it—is the tendency of internationally traded goods to have the same prices everywhere. A commodity is cheap or costly depending upon its supply. It will be cheap in a country where it is produced with abundant supply of some essential factors ; it will be expensive in that country where it cannot be produced or where it can be produced at only high cost. Through trade, the supply is reduced in the country of its manufacture (and thus its price is raised) ; and the supply is increased in the importing country and thus the price is reduced. In this way, there is a tendency for equalisation of prices of all internationally traded goods. It is true that perfect equalisation is not possible because of the existence of transport costs and also of tariff duties. If the movement of goods between countries is made free without any artificial obstacles, then international prices will differ only by the amount of cost transportation. For instance, the price of raw cotton will be the same in Bombay, Alexandria, Manchester and New York, except for the differences in the cost of transportation.

By bringing about equality of prices of goods, international trade helps also to bring about equality of prices of the factors also. Abundant factors in both the countries will command higher demand and, therefore, higher prices also. But complete equalisation of factor prices will not be possible in practice. If and when factor prices are equal, there will be no tendency for trade itself to take place.

Availability of Scarce Materials—International trade is the only method by which a country can supplement its shortage of resources or certain essential materials. There is no country in the world, including the U.S.A. and the U.S.S.R., which has all the resources it requires. At the same time, there are some countries like Malaya, or Indonesia which has been blessed by nature with some rare materials like rubber and tin. International trade ensures equal access to raw materials for all countries of the world. Many a war has been fought by advanced countries for equal access to or exploitation of scarce raw materials and petroleum resources.

International Trade and the Evolution of Modern Industrial Society—The modern industrial society is based on extensive specialisation and large-scale production. Both are based on the size of the market. The larger and more extensive the market for the products, the greater is the degree of specialisation and large scale production. It is for this reason that Adam Smith stated that the division of labour is limited by the extent of the market. It is through international trade that the markets for products have been expanded to cover the entire world. Hence,

it will be perfectly true to say that the modern industrial society could not have been developed in the absence of international trade.

2. DIVISION OF GAINS BETWEEN COUNTRIES

So far we have been discussing about the general gains from trade and the arguments usually given in favour of free trade. The question we have to answer now is : how much will be the share of each country in the gains from trade ? It is difficult to give a quantitative measurement of such a division of gains from trade. But economists attempt to measure the gains from trade for each country on the basis of the terms of trade. Let us take our usual example of India and Burma and the two commodities of cotton and rice :

In India, the cost ratio of production

: 100 units of cotton = 100 units of rice.

Or

1 unit of cotton = 1 unit of rice.

In Burma, the cost ratio of production

: 40 units of cotton = 80 units of rice.

Or

1 unit of cotton = 2 units of rice

The terms of trade will lie between 1 to 2 units of rice for a unit of cotton. But what will be the actual terms of trade ? As we have seen in the previous chapter, the actual terms of trade at any particular time will depend upon *reciprocal demand*, i.e. India's demand for Burma's rice and Burma's demand for India's cotton. Suppose, as a result of this reciprocal demand, the actual terms of trade are settled at 1 unit of cotton = 1.5 units of rice. India gains by specialising in the production of cotton and by exporting it, to the extent of 50 per cent. Burma gains by specialising in rice production and by exporting it, to the extent of 25 per cent (it was prepared to give 2 units of rice, but actually gives only 1.5)

Now, if India's demand for Burmese rice is more inelastic as compared to Burmese demand for Indian cotton, then the terms of trade will lie nearer the rate which India is prepared to accept (i.e. 1 cotton = 1 unit of rice) and, therefore, the gain to India will be less, but the gain to Burma will be more. On the other hand, if India's demand for Burmese rice is more elastic as compared to Burmese demand for India's cotton, then the terms of trade will be closer to the rate which Burma is prepared to accept (i.e. 1 unit of cotton = 2 units of rice) and, therefore, the gain to India will be more, but the gain to Burma will be less. Thus, the share of each country in the gain in international trade will depend upon the terms of trade, which in turn, depends upon reciprocal

demand or mutual elasticities of demand. The analysis becomes more complicated if we take more than two countries and more than two commodities.

We can give a simple diagrammatical representation of the division of gains from trade between two participating countries. In the figure below we represent cotton on the $O\bar{X}$ axis and rice on the OY axis. Line OI represents the opportunity cost ratios of cotton to rice in India. Line OB represents the opportunity cost ratios of cotton to rice in Burma. The terms of trade will have to lie between these two opportunity cost ratio lines. We have given the offer curves of the two countries; India's offer of cotton for rice and Burma's offer of rice for cotton. At the point where the two offer curves intersect, the terms of trade will be settled. This point is E . India's gain is equal to DE ; for, India is prepared to accept CD units of rice for OC units of cotton (this is the cost ratio within India) but she is able to get CE units of

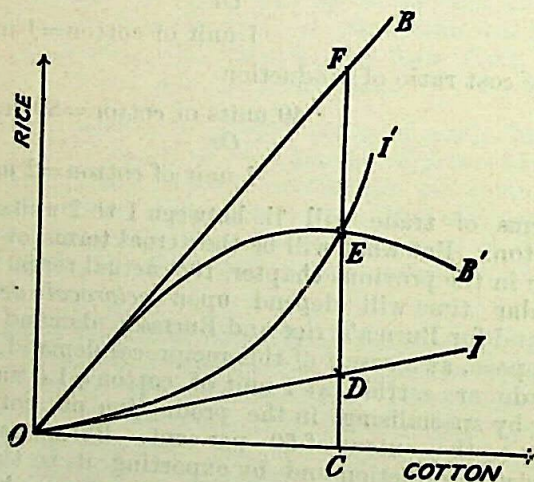


Fig. 49

rice. Burma's gain is given by EF . For, Burma is willing to give as much as CF amount of rice for importing OC units of cotton but actually gives up only CE units of rice. Thus, both the trading countries gain from trade.

We may give the concrete example of Britain and the United States which grew rich through mutual trade. Britain grew rich not only by exporting manufactured equipment such as steel rail and locomotives and earning good interest income from investment in the United States but even more by gaining access to vast new supplies of food and raw materials to feed her growing industrial towns. The United States, on the other hand, grew rich by exporting

and-borrowing to equip itself rapidly with modern means of production and transportation.

A very good case can be made for free trade for countries like the United States on the ground that :

(a) National power and interest of large countries warrant large scale production based on international trade.

(b) Only through international trade, backward and industrially underdeveloped nations can be helped to raise their level of production and employment.

(c) In a broad way, it is possible for economies to go for full employment and stable incomes and at the same time encourage international trade.

3. DISADVANTAGES OF INTERNATIONAL TRADE

While, on the one side, economists have consistently upheld the benefits of free trade to nations, the governments, on the other hand, have introduced restrictions on the flow of trade between countries. This is on the ground that international trade has certain disadvantages which governments cannot ignore.

In the first place, international trade, leading to international specialisation may result in wrong and lopsided development of a country. International specialisation is good for strong and economically advanced countries but bad for weak nations. In the past, industrial countries like England became more industrialised through selling their manufactures in the backward countries and forcing the latter to remain primary producing countries. Colonial exploitation of African and Asian countries by the European countries is the direct result of free trade.

Secondly, international trade makes a country dependent on other countries and this may prove dangerous during a war. Suppose India depends on Pakistan for imports of some essential products say raw jute. India will not be able to get them in times of war. Hence, it will be necessary for a country to produce at least a small quantity of these essential goods to remove its dependence on others.

Thirdly, international trade may make people accustomed to cheaply manufactured foreign goods and thus destroy local industries. A good example was the destruction of Indian handicrafts, particularly cotton textiles, through free and unrestricted imports of English textiles.

Fourthly, interests of the future may be sacrificed for the benefit of the present. For instance, India may be rich in minerals and may export them in order to benefit from international trade. India has been exporting iron ore and many other important minerals to other countries. At a later stage when local industries

come up, they will be handicapped because of the exhaustion of essential minerals.

Finally, international trade has been responsible, to a certain extent, for one country to experience the adverse effects of a business recession in another country. For example, it was the depression in America in 1929 which spread to the rest of the world. American prices fell, resulting in the fall in American incomes and American demand for foreign goods. The prices and incomes of other countries also fell. It will be in the interest of a country to isolate itself from such consequences.

These are good arguments against international trade but they are not substantial enough to refute the case we built for free trade through our emphasis on the gains from trade.

Tariffs and Other Forms of Trade Control

Trade between two countries may be prohibited or restricted by prohibition of imports and exports, fixing of export and import quotas and the use of custom duties. Of these different methods, the most common one, as we have seen, is the use of customs duties or the tariff system under which imports and exports are subject to certain taxes. These taxes may be levied for two purposes, *viz.*, to get revenue and/or to restrict the volume of trade between two regions. Customs duties levied to bring in revenue may indirectly restrict trade just as those levied to restrict the volume of trade may incidentally bring in revenue to the government. In this analysis, however, tariff walls have been taken to mean only those taxes which are intended to restrict international trade. Instead of calling these customs duties and the tariff walls as restrictive, it has become customary to refer to them as protective duties because in the 19th century and in earlier periods they were used mainly to protect local industries. Therefore, economists normally use the term 'protection' as the opposite of free trade, while actually they should use the term 'restriction'.

The earliest exposition of the theory of protection in the modern form was by the American statesman, Alexander Hamilton, who advocated protection for the encouragement of struggling American industries. In Germany, Friedrich List advocated the views of Hamilton and was instrumental in the use of customs duties to develop German industries in the face of the competition from English industries. The views of Hamilton and List have in course of time spread throughout the world and are now taken up by the underdeveloped countries in order to defend their restrictive policies.

1. FORMS OF RESTRICTION ON INTERNATIONAL TRADE.

There are many forms of restrictions on international trade but the most common method is the use of tariffs or duties. A tariff or duty on the import of commodities from abroad is one of the earliest and the most widely used methods of limiting imports. There are different types of tariff systems. In the *single column or uni-linear tariff system*, a country gives uniform treatment to all like commodities regardless of the country of origin. In the *general*

or conventional tariff system, the country provides for a general column of duties applicable to all countries except to those with which specific tariff treaties or conventions have been made. Again, some countries may have a tariff system with maximum and minimum rates for like commodities, in which minimum rates may be granted to "most favoured nations" with which special treaties have been entered into, and maximum rates may be levied on imports from other countries. Lastly, a country may follow a preferential tariff system under which it may give exclusive trade privileges to nations related to it by political, racial or regional ties.

A tariff duty levied and calculated on the basis of physical unit—so many rupees a maund or ton or yard and so on—is known as a specific duty. But if a duty is calculated on the basis of the value of goods and not on the basis of physical measurement it is known as ad valorem duty. A customs duty is known as compensatory duty if it is levied on imported goods for the purpose of raising their prices to protect domestic producer from loss because of duties on raw materials entering into the manufacture of such goods. A countervailing duty may be levied on those imported goods which are supported by their home governments through subsidies or bounties; a countervailing duty will be in addition to the original customs duty and the purpose is to ensure the degree of protection originally intended. If a country is imposing customs duties in general but permits free imports of any particular commodity, such a commodity is said to be on the *free list*.

Just as customs duties are levied on imports, they may be imposed on exports also. Till the 1930's, the tariffs were the most common method of restricting imports but during the Great Depression and with the growth of economic nationalism other methods have also been devised to control and restrict trade.

Quantitative Restrictions—The second important type of restriction on international trade may be known as quantitative restrictions which are direct limitation upon the physical amounts of certain goods that may be imported during a given period of time. Countries adopting quantitative restrictions generally adopt the system of licensing and quotas. Licensing is resorted for limiting the quantities to be imported by specified importers and the total amount to be imported is restricted by the system of quotas. Imports are limited to the quotas allocated among the several supplying countries. Originally introduced to relieve foreign exchange difficulties, quotas have been found to be a very useful system for protection against foreign competition and for strengthening foreign exchange reserves by limiting imports. During and after the Second World War, the quota system became quite common everywhere.

Exchange Restrictions—The exchange restrictions, developed during the Great Depression constitute another important method

for restricting international trade. During the depression of the 1930's many countries experienced extreme shortage of foreign exchange reserves and they found it necessary to control and restrict the purchase and sale of foreign exchange. This system of control over the purchase and sale of foreign exchange was soon recognised as an effective method of restricting imports. The system was used not only to protect foreign exchange reserves but also to keep out certain types of foreign goods and, not unoften, it was used as a political weapon. The most common practice under exchange control system is to classify goods according to their importance and fix priority for their imports accordingly. Exchange control has obvious advantages in restricting trade but it has generally been felt that it leads to distortion of production and trade and to much of administrative corruption and arbitrariness.

Miscellaneous—Other methods of restricting foreign trade include multiple exchange rates (under which different exchange rates are applied to different types of goods), the so called sanitary regulations (to prevent the import of goods on the basis of health and welfare), import sur-taxes (special taxes on dutiable imports) and linked purchase regulations (which require for every import a fixed proportionate purchase of domestic articles), etc.

It may be observed here that the various methods of restricting foreign trade which we have described above constitute a serious barrier to the free flow of trade between countries. In recent years, however, many successful attempts have been made to facilitate the growth of world trade through simplification and reduction of these restrictions.

2. PROTECTION FOR ECONOMIC DEVELOPMENT

The infant industry argument has been considered the most cogent economic argument in favour of protective tariff, since it is meant to promote a country's economic development. An infant industry is one which has been started lately and which has not reached the maturity and strength necessary to enable it to face foreign competition from long-established industries. Unless an infant industry is protected against foreign competition in order to enable it to develop sufficiently and stand on its own legs, it will be impossible for such an industry to be started, and if started, to develop rapidly. The infant industry argument is, therefore, based on the recognition of the sound fact that old established industries command a certain degree of superiority over newly established ones.

List and others, who advocated the infant industry argument in favour of protective tariff were not against free trade, for they were fully aware of the advantages of free trade and specialisation. But they advocated restriction of trade to enable a weak nation to develop in the face of competition from a powerful manufacturing rival. By helping an industrially weak nation to develop in the

first instance they advocated the widening of the area of geographical division of labour. The volume of trade between two equally strong nations would be more than that between a strong nation and a weak nation.

Besides, those who advocated the infant industry argument did not advocate it as a permanent device to help economic development but only as a temporary expedient till such time that the infant industry reached maturity and could face foreign competition unaided. Moreover, protection should not be given indiscriminately but only to those infant industries, which have potentialities to develop fast and stand on their own legs. For example, an industry which required protection should possess natural resources, plenty of cheap labour, electricity and other sources of fuel, a good and extensive market within the country and in certain cases, outside also; and so on.

Closely related to the infant industry argument is the use of tariff in general for the development of the productive powers of a nation. In an underdeveloped and backward nation all industries will be in the position of infant industries and will not be able to develop unless all of them are protected. In this case, tariffs are used to help an underdeveloped economy to develop itself even though it may be faced with the competition and supremacy of manufacturing and commercial nations. As in the case of infant industries, tariffs are advocated here to help only those young nations which have natural and other facilities which will enable them to develop fast and stand on their own legs without the artificial support of tariff walls.

Merits of the argument—The use of tariff for the development of the productive powers of a nation as a whole is probably the most intellectual argument in favour of protection. As pointed out earlier, the infant industry argument is not against free trade as such but pleads that all countries should develop themselves fully in the first instance so that the volume of trade may be maximised. Besides, it is rightly held that the countries which have been fortunate enough to industrialise themselves earlier should not make use of this advantage against unfortunate countries which, owing to many reasons, both political and economic, have not been able to industrialise themselves. It is argued that free trade will condemn the underdeveloped countries to remain underdeveloped for ever, while the already industrialised countries would continue to get the benefits of industrialisation. It is essentially on this ground that underdeveloped countries have been permitted by other countries to enforce protective tariffs.

Demerits of the argument—In practice, however, these arguments in favour of the use of tariffs face certain difficulties. *First*, it is difficult to find an industry which fulfils all the requirements so as to entitle it to protection. No industry can possess sufficient raw materials, adequate and fully trained labour force,

adequate capital, a sufficiently large home market, etc., all of which are required to ensure development to the point of maximum efficiency. *Secondly*, it is rarely that protection, once offered, is given up, even though, according to theory, the industry is given protection only for a temporary period. An industry which gets this artificial help against foreign competition would rarely like to give it up and thus protection tends to become permanent. In such a case, protection is against the consumers' interest, for they are denied cheap foreign goods permanently and are forced to pay higher prices for the local manufactures.

Ellsworth has pointed out that a country with plenty of natural advantages would automatically develop industries—protection or no protection. A good example is the development of the cotton textile industry in India in the 19th and 20th centuries in spite of the most intense competition from England and Japan. Hence, protection, it is argued, is not really necessary.

But it cannot be denied that protection can speed up industrialisation through encouragement to industries and, therefore, through larger investment.

3. PROTECTION TO PROMOTE EMPLOYMENT

The argument of using tariffs to increase employment in a country was extremely popular during the Great Depression of the 1930's when the entire world suffered from serious cyclical unemployment. Protection may offer relief to a country suffering from heavy unemployment in two ways. Directly, the imposition of a protective duty will keep out certain imports and the money so saved can be spent upon the purchase of home-produced goods. Thus there is a favourable effect upon income and employment—the protected industries will expand and give employment to a larger number of persons. Indirectly, the expansion of protected industries will lead to expansion of other industries which supply raw materials and other goods to the former and thus they also will experience expansion, resulting in increase in employment.

Free traders, however, argue that the employment argument, though logically valid, has little to commend itself as a practical policy. Since exports pay for imports, reduction in the volume of imports owing to the imposition of tariffs will cause an equal diminution in exports. Additional employment caused by the reduction of imports may be neutralised by an equal or probably greater unemployment caused in the shrinking export industries. This argument of free traders is wrong for two reasons. In the first place, the diminution in imports because of the imposition of a tariff may not be followed by a simultaneous diminution of exports, as the free traders have assumed. Even if it is assumed that there is a simultaneous fall in exports because of the restriction on import it does not mean automatic reduction of employment in the export industries. Either, the money which was formerly spent by people on foreign goods is now used to demand

locally produced goods and also demand more of the goods of the export industries; thus, the export industries develop and expand along with the protected industries. Or, the increased income because of the restriction of import may be used to demand some goods or the other and not necessarily the goods of the export industries and thus the level of employment in any case may be maintained and even increased. It may be concluded that the tariffs have a favourable effect on the level of employment.

In order to analyse the effects of tariffs on the level of employment, it is necessary to distinguish between the three following broad types of unemployment and to study the effect of tariffs in each case.

In every country, there are some industries and occupations which offer employment for only a certain number of months in the year, as for example, the sugar industry, cotton ginning and even agriculture itself in India, which is not a whole-time occupation. In such cases of **seasonal unemployment**, tariff protection is of no use as regards employment position. What is really necessary is the creation of subsidiary and by-products industries in those localities where seasonal industries are located and offer profitable employment to workers during the off-season.

Structural unemployment is inevitable in a dynamic economy, for it is always possible that some industries lose their significance because of changes in the tastes and preferences of consumers while new industries come into prominence. Therefore, workers employed in the depressed industries will be losing their jobs, while those industries experiencing expansion will be requiring additional hands. Either the unemployed workers are unable to locate the industries offering them employment or they fail to avail themselves of the new opportunities due to frictions such as lack of skill required for the new jobs or immobility, and so on. The shift from one job to another seldom takes place without friction and without time-lag. This is especially true when the change from one job to another involves the migration from one region to another. The question now is whether frictional unemployment can be remedied by the use of protective tariff. If an industry is subjected to the growing pressure of competition of imports and is threatened with unemployment, it is possible to diminish or avoid such unemployment for the time being by means of tariffs. But frictional unemployment may not always be due to foreign competition. In such cases, it is better that frictional unemployment is remedied through the use of labour exchanges which will direct labourers to those areas where they are required and also through the establishment of technical institutes which will educate and retain the workers to take up jobs in new industries.

Cyclical unemployment is associated with the downward phase of the trade cycle. When effective demand for goods and services falls, production and employment also fall. It was to

remedy this situation that tariffs were originally introduced during the last depression. If a country follows this policy, it may be possible for it to expand the level of employment, directly in the case of protected industries and later indirectly in other industries also. It may also be argued that tariffs, by separating a country from the world economy, may render the country immune from crises. But when many or all countries follow restrictionist policies, world trade will dwindle and all the advantages of international division of labour and specialisation will be lost to countries and, to that extent, welfare will come down. Tariff, therefore, may be useful to any particular country to remedy cyclical unemployment but it cannot be a solution if such unemployment is world-wide as it was during the thirties of this century. Keynes and Hansen advocated the use of fiscal policy to create employment and increase effective demand, production and national income.

Thus, one of the popular arguments in favour of restriction on international trade is to raise the level of employment but how far the imposition of tariffs will bring about full employment in a country is a difficult point to answer. The imposition of protective duties by a country will have the effect, for the time being, on reducing imports without having any unfavourable repercussion on the country's exports. Imports having been cut down, employment will be created in the country since the articles hitherto imported will now be produced within the country itself. On the basis of theory of employment multiplier, the primary employment will, in its turn, generate waves of secondary and tertiary employment within the economic system. The expansionary effects of the initial employment generated by the imposition of protective tariff will exhaust itself at a certain stage. But the basic difficulty will be whether it is possible to expect co-operation and, not retaliation, from other countries.

4. TARIFFS AND DIVERSIFICATION OF INDUSTRIES

One of the most common arguments in favour of protection, both in the past as well as at present, is known as the diversification argument. It is argued that the system of international trade where individual nations increasingly seek to specialise in a narrow range of exports and depend upon others for a wide range of imports is very unstable and risky for a country. Not only does a country depending much on international trade become subjected to the dangers of recurring economic fluctuations but also become highly unbalanced. Sometimes such a country has to depend upon others even for the basic amenities of life—take for example, England's dependence on other countries for its bread, meat, butter, tea, etc. Many highly specialised producers of foodstuffs and raw materials, like Australia, Argentina, Mexico and others experienced the disadvantages of specialisation during the Second World War. Thus almost all countries have come to realise the need to reduce dependence on other countries and create a more

balanced and self-sufficient economy through a system of protective tariffs.

There is another important reason why diversification of industries is recommended. In these days of mutual jealousies and conflicts between countries it is necessary that each country should develop all the industries considered strategic or important from the point of view of national defence. In times of war, it will be dangerous for a country to depend upon others for supplies of strategic materials. From the standpoint of national defence, therefore, each country should avoid too much dependence on other countries, which results from specialisation and international trade.

This argument, which pleads for national self-sufficiency, balanced growth of all industries and absence of complete specialisation, has merits of its own especially in these days of international conflicts and tensions. But the problem is whether every country can achieve complete self-sufficiency and diversification of industries. For one thing, even such vast countries as the U.S.A. and the U.S.S.R. do not possess all the raw materials and minerals which are required for many of the industries. Even if they possess all the natural resources, they may not possess them to such an extent as to satisfy their full requirements. For example, the U.S.A. has petrol, so necessary for the internal combustion engines, but its internal supplies are not sufficient for its needs. Thus, it is not possible for any country to be completely self-sufficient. Secondly, even assuming that a country has all the natural resources required for all types of industries, the ideal of self-sufficiency and diversification will condemn a country to produce at a high cost certain goods and services which can be cheaply imported from others and thus force it to accept a low standard of living. Lastly, complete isolation is not possible in modern times. Hence the diversification argument in favour of protection is weak and Haberler characterises it as a non-economic argument.

5. OTHER ARGUMENTS FOR PROTECTION

The use of customs duties against dumping is one of the arguments in favour of protection. Dumping is selling in a foreign market at a price lower than home-market price. If the purpose of selling at a lower price in the foreign market is to destroy competitors there, it is ruinous to them and hence there is a need to prevent such dumping. It is advocated that tariffs may be used for this purpose. But most economists agree that by the time protective duties are imposed, damage would have been done by dumping. Hence it is necessary to devise other methods to remove dumping.

Protective tariff is sometimes imposed, especially in the industrially advanced countries of the world, on the ground of safeguarding the interests of labour. It is said that in the absence of protection the highly paid labourers in the industrially advanced

countries would be exposed to the competition of cheap foreign labour. It is maintained that the products of high-wage labour can be undersold by those of 'pauper labour'. Hence, this argument has been extremely popular in America. However, it overlooks two vital factors : *first*, labour is not the only factor of production; and *secondly*, efficiency of labour differs greatly in different countries. A country may have a high level of wages because of scarcity of labour as compared to other factors and also because of high efficiency of labour. It should be noted that high wages are no bar to low-cost production, and that low wages do not automatically mean low-cost production. It is very interesting to note here that while America advocates the use of tariff against goods made by cheap labour, there are other countries like Italy which appeal for protection against the products of American and British mass production methods.

Other arguments in favour of protection are : checking imports of luxuries, improving the balance of payments, counteracting the lower costs of foreign countries, creating and expanding a home market, using it for bargaining purposes with other countries, and so on.

6. TARIFFS AND UNDERDEVELOPED COUNTRIES

We have given many arguments in favour of protection and the reasons to restrict international trade. We shall now evaluate the various arguments from the point of view of an underdeveloped country like India.

Protection of infant industries is an absolute necessity since without protection they will never be able to develop. In India, this argument assumes a far greater importance than elsewhere. For one thing, India is extremely rich in natural resources—in raw materials, sources of power and human resources. India has immense potentialities for industrial growth and expansion. But in the face of intense competition from other countries which were fortunate to develop industries earlier because of political and other favourable circumstances, Indian industries could not either be started or when started did not make rapid progress. The result was that India was condemned to be an agricultural economy, with a low standard of living and with an extremely low per capita income. Therefore, infant industries argument assumes a special meaning in a country like India.

In this connection, it is interesting to note Pigou's opinion : "The case for protection with a view to building up productive power is strong in any agricultural country which seems to possess natural advantages for manufactures. In such a country, the immediate loss arising from the check to the exchange of native produce for foreign manufactures may well be outweighed by the gain from the greater rapidity with which the home manufacturing power is developed." A very good case can, therefore, be made out for the restriction of international trade if foreign competition

can be minimised and backward agricultural economies are allowed to develop their industrial potentialities.

It is important to emphasise here that protection is not suggested as a permanent feature of an economy but only as a temporary expedient to help industries. Only those industries which have a bright future and which are essential to the country for strategic and other reasons should be selected for such help. Further, once the protected industries have reached maturity, it would be necessary to withdraw protection.

Protection is sought to be justified from another point of view also, viz., the changed circumstances of the 20th century. In these days of international conflicts and tensions, power blocs and currency areas, it is difficult for a country to depend on other countries for some of its essential materials; this may prove dangerous to do so. To speak about international co-operation and free trade may not be practical policies. Defence, self-sufficiency and full employment are some of the ideals which should be kept in view by any modern government in evolving a tariff policy suited to the needs of the country.

Lastly, protection is one of the methods or weapons in the hands of the modern State which attempts to bring about economic prosperity through planning. For instance, the Indian Government wants to control, interfere with, centralise and regulate all economic activities. It is but obvious that the Government will control foreign trade too. Rapid industrialisation will be brought about through the planning of labour and capital resources and also by the use of protection. In the hands of a planning authority, protection is one of the many methods to bring about planned economic development. This, in fact, is the present policy of the Government of India.

Multilateral And Bilateral Trade Agreements

1. MULTILATERAL TRADE

A country is said to have multilateral trade relations when it permits trade with many countries, and when it allows its currency to be convertible to a number of other currencies. Suppose India has trade agreements with a number of countries and allows the rupee to be freely convertible to the currencies of all other countries of the world, India is said to follow multilateralism. India may have surplus balance with some countries but deficit with others. For after all, under multilateral trade, importers and exporters are free; importers buy in the cheapest markets and the exporters sell in the dearest foreign markets. At the same time, the decisions to import and export are made independently. Naturally, there is no reason at all why imports and exports between India and any other country should balance. But under multilateralism, India will use its surplus with one country to offset its deficit with another country. Multilateralism implies that a number of countries adopt free trade and do not have any tariff and other restrictions or have the minimum of restrictions. During the 19th century and upto the first World War, international trade was multilateral and this was facilitated largely by the existence of London as the financial centre of the world. Almost all countries of the world had kept their accounts with London banks and it was easy to settle their external accounts through the London banks.

The case of Multilateralism

The argument for multilateral trade agreements are the same as arguments for free trade itself. Countries must be free to import and export to any or all countries import; from the cheapest sources and export to those countries, where the prices are the highest. Multilateralism, therefore, promotes international specialisation and the application of the principle of comparative advantage. As every country concentrates and specialises in the production of those goods in which it has comparative advantage and is better placed, there is increased production allround

and great scope for higher standards of living for all the trading countries. Further, multilateral trade helps to equalise prices of goods and factor services in all the countries. Besides, multilateral trade removes discrimination in international trade. In the absence of multilateral trade, there are direct controls and import duties and as a result relative prices are not equalised. Finally, multilateral trade bring about a free currency system, under which surpluses and deficits are cancelled out and under which one currency can be easily converted to any other currency.

Multilateralism in the Past and Present

Towards the end of the 18th century, England took the lead in removing restrictions and discriminations imposed on international trade. Under the influence of Adam Smith, England concluded trade agreements with France, Portugal and other countries, containing "most-favoured-nation" clauses. Privileges in trade made available to one country were made available to other countries also. Discriminations in imports and exports as well as in rate of exchange were removed. Import duties were reduced and in most cases were eliminated altogether. By the middle of the 19th century, England was on free trade and under its influence, other countries too adopted free trade. As we have mentioned earlier, free trade is the same as multi-lateralism.

This state of affairs did not continue for a long time. Some countries like Germany and United States of America introduced import duties to restrict imports with the idea of encouraging domestic industries so as to speed up economic development. Towards the last quarter of the 19th century, restrictions on the free flow of international trade were increasing. But by and large, multi-lateralism was prevalent till the beginning of the First World War. It was during the inter-war period, specially during and after the great business depression of 1929-33 that countries abandoned multi-lateralism and adopted bilateral trade and payments agreements. The trend towards bilateralism was becoming extremely common after the Second World War. However, even in the midst of common bilateral trade agreements, there have been three important organisations which have been promoting regional multilateral trade and payments. These are the dollar area, the sterling area and European Payments Union (E.P.U.). Let us describe briefly how these organisations have been promoting regional convertibility of currencies and regional multilateralism.

The Dollar Area consists of the United States of America, Canada, the Central American countries and some of the South American countries. These countries are closely tied together because of common economic bonds. Their imports and exports are mostly to one another. Most of the dollar area countries export their commodities to the United States of America. Hence they have been demanding dollars for their exports to other countries outside the dollar area. Generally, they have not discriminated

between countries, but some of them impose quantitative restrictions on trade and multiple exchange rates.

The Sterling Area consists of the British commonwealth countries, minus Canada (which belongs to the dollar bloc) plus several Middle Eastern countries, Burma, Ireland, and others. The pound sterling which is the British currency, is the connecting link of the sterling area. All member countries of the Sterling Area keep their reserve balances in sterling in the London banks and use them to settle accounts between them. A surplus or deficit in the external balance of payments is adjusted in the London banks. The Sterling Area countries are connected together through political and economic relations and have imports and exports mainly with one another.

Upto 1931, the Sterling Area countries were closely knit together and their export and imports were pre-dominantly with one another. After 1931 sterling became free and lost much of its importance, but even then the Commonwealth countries found it useful to keep their international reserves in London. For one thing, the pound sterling continued to be stable and thus protected the imports and exports of the sterling area countries from fluctuations. For another, the international trade of these countries were mainly with one another. There was thus, multi-lateral trade and payments, but within the sterling area.

After the Second World War, the member countries of the Sterling Bloc were brought together into a limited multi-lateral trade and payments, but the system involved discrimination against the dollar area. There was acute shortage of dollar in the post-war period, and therefore the Sterling area countries were encouraged to export to the dollar area countries but were asked to restrict their imports from the dollar area to the unavoidable minimum. Member countries imposed discriminatory restrictions on transactions requiring payment in dollars. Members usually follow the lead of Britain in determining the nature of controls and restrictions to be imposed on dollar transactions. The dollar reserves of all the sterling area countries were pooled together and were rationed out to the different members on the basis of need.

Within the Sterling area too, there may be restrictions on the movement of trade and payments. For example an Indian may not have the right to buy as many British goods or British pounds as he wishes. But by and large, it was possible for member countries of the Sterling bloc to pay their debts with others with one another out of their sterling earnings. Thus, the sterling area provided a widespread multilateral system of international trade.

European Payments Union (E.P.U.) was organised by 17 nations of Western Europe in 1950 in order to overcome the difficulties of bilateral trade and payments agreements which were

the common feature of European trade since the Second World War. After 1945, European countries made a series of bilateral payments agreements between themselves to overcome their payments problems. Under these bilateral agreements, one country extended credit to another country, in case of deficit with the former. This system did enable countries to expand trade with each other. But there were a number of difficulties which actually tended to restrict the volume of international trade.

(a) When a debtor country continued to have persistent deficit balance of payments (excess of imports over exports), the creditor country was reluctant to extend further credit.

(b) After the original credit was exhausted, the creditors were unwilling to extend fresh credit, and the debtor countries were reluctant to pay gold or dollars to pay for additional imports.

(c) Debtor countries attempted to adjust their balance of payments through cutting down their imports.

(d) As payments between countries were bilateral, it was possible for a country to have a surplus with one country but deficit with another. But the surplus with one country could not be used to settle the deficit with another country.

(e) A country would grant licences more freely for imports from countries with which it had a surplus than for imports from countries with which it tended to have a deficit. There was thus discrimination because of bilateral arrangement.

Because of the above reasons, the trade between the European countries had been badly restricted and there were many types of discrimination between them. To solve these difficulties, the E.P.U. was formed. The E.P.U. has a clearing agent to whom every member country reports its bilateral position with every other member country. The clearing agent then determines the net position of each country with respect to all the other members. This system automatically offsets all the deficits of a country with all its surplus. In case a member country has an over-all surplus (after cancelling its deficits with other members), it receives from the clearing agent part of its surplus in dollars and part of it in the form of credit. On the other hand, if a member country has an over-all deficit (i.e. its payments exceed receipts from all the member countries) it has to pay the E.P.U. clearing agent, part of the deficit in terms of gold and dollars and part of it in the form of loan.

The E.P.U. has helped in the expansion of international trade and has helped in the removal of discrimination between countries. First of all, a member country need not bother about its trade position with every other member but only with all the members as a whole. Secondly, a member country need not discriminate

between countries in the matter of import licensing and can import from any of the countries. Finally, member countries are now permitted to use their surpluses to offset their deficits. In this way, the E.P.U. has helped to bring about a regional multilateral payments and trade in Europe. In a sense, the E.P.U. is more than a regional multilateral system, since it is including many other countries as well. For instance, the politically dependent territories of the Western European countries are also included within the E.P.U. Besides, Britain is a member of the E.P.U. and as such all the members of the Sterling Area come under the E.P.U. in an indirect manner. Thus, the area of multilateral trade and payments of the E.P.U. is considerably expanded.

Multilateralism and International Institutions

The Dollar Area, the Sterling Area and the European Payments Union have promoted regional multilateral trade and payments. In the post-World War II period, two institutions have been created to bring about international co-operation in the field of international trade as well as international convertibility of currencies. We mean here the International Monetary Fund (I.M.F.) and the General Agreement on Tariffs and Trade (G.A.T.T.) Member countries of the I.M.F. have agreed to adopt certain practices through which multilateral trade would be promoted. In the first place, they will not impose any restrictions on making payments for current interanational transactions. Secondly, they will not adopt multiple exchange rates for different currencies or adopt any other discriminatory practices. Finally, member countries will permit convertibility of their currencies into the currencies of all other member countries. These are important provisions of the I.M.F. and they were designed to bring about multiconvertibility of currencies and to promote multilateral trade between member countries.

However, in practice, a number of exceptions were introduced which reduced the effectiveness of the I.M.F. For instance, the Fund Articles permitted members to maintain restrictions on international payments during the transition period, which was extended. So much so, there are quite a large number of member countries which still follow restrictions in the matter of convertibility of their currencies. (India is a good example of this). Again, the Fund has expressly allowed discrimination in the case of scare currencies. That is, member countries are permitted to restrict exchange operations in a scarce currency like the dollar.

The parties to the General Agreement on Tariffs and Trade (G.A.T.T.) agreed that they would not discriminate and would impose no restrictions on international trade other than duties and taxes. They would exclude the use of multiple exchange rates, quotas and import licences. While the I.M.F. attempted to control restrictions on international payments, the G.A.T.T. covered the use of trade restrictions. But the parties to the G.A.T.T. were

allowed to impose import restrictions to stop a serious drain on their international cash reserves or to build up reserves, in case their reserves had fallen low.

Efforts are also being made to bring about multilateral trade and payments through the European common market, the attempt to organise an Asian Common market, the North Atlantic free trade area and so on.

2. BILATERAL TRADE AND PAYMENTS AGREEMENTS

In the 1930's, international trade was depressed by low levels of economic activity and also by balance of payments difficulties. To overcome these difficulties, countries entered into bilateral trade and payments agreements. Likewise, in the period after the Second World War, shortage of foreign exchange reserves to pay for imports forced many countries to enter into bilateral agreements. Bilateralism is said to exist when (a) two countries enter into an agreement as to the items and the quantity of items to be imported or exported during a given period of time; and (b) country balances its receipts and payments with every country separately, rather than with the world as a whole. In almost all cases, bilateral payments and clearing agreements have led to bilateral trade agreements.

Objectives and Purposes of Bilateral Agreements

The depression of 1930's and World War II disrupted the course of international trade and the result was the use of international agreements to regulate trade and payments. The objectives of these agreements were :

(a) Some of these agreements evolved from bilateral clearing agreements which were meant to settle balance of payments difficulties. Some countries, for instance, accumulated foreign balance which were blocked because of non-availability of foreign exchange. Bilateral agreements were made so as to release the blocked currencies.

(b) Some trade agreements were made in order to permit trade, where it might not have taken place otherwise. For instance, countries were consistently facing a shortage of international reserves and they entered into agreements that provided a means of expanding trade.

(c) Some trade agreements arose because of the desire of a Government for an outlet for a given surplus of a commodity or to get access to a scarce commodity.

(d) Some trade agreements were made for the sake of bulk-buying and selling. This was done by countries which have generally adopted economic planning and which wanted to protect themselves against uncertainties.

(e) In the post World War II period, when dollar and gold was extremely short, countries entered into bilateral agreements

so as to balance their imports and exports and to minimise payments in gold or dollar.

(f) Soviet Russia entered into a series of bilateral trade agreements with Eastern European countries partly to help them in their economic development but mainly to keep them under its economic influence and domination.

By 1939 there were about 170 bilateral agreements among countries. Germany used its bilateral trade and payment agreements to compel weaker countries in Europe to accept whatever Germany could offer and export to the latter their most important materials. In 1947 there were about 200 bilateral agreements and by 1954 there were as many as 400 such agreements.

Types of Bilateralism

Four well-known bilateral trading methods have been in use viz., Private compensation, exchange clearing agreements, payments agreements, and bulk-purchase contracts. We shall describe each one of these four methods briefly.

(i) **Private Compensation**—In 1932 and 1933 German exporters faced increasing difficulties in exporting to free exchange countries because of declining demand and increasing competition. At the same time, exports to countries adopting exchange control were restricted because of their exchange control measures. The exchange control countries were willing to pay, not in free exchange, but only in their own currencies. In such a case, the German exporters to a country, say, Greece paid in Greek currency which could not be converted to the German mark or to any other currency. This resulted in the accumulation of unwanted blocked balances. The German authorities were unwilling to be paid in such currencies. To facilitate sales in such countries, German exporters entered into direct barter, known as private compensation, under which a German firm would export a commodity and in exchange accept an equivalent value of some import. For instance, German coal worth 9 million marks was exchanged for Brazilian coffee; German fertiliser was exchanged for Egyptian cotton; and German cigarettes were exchanged for tobacco from Greece, Bulgaria and Turkey. Private compensation is pure barter, under which one commodity is exchanged for an equivalent of another commodity. This type of bilateral agreements has not been very common.

(ii) **Exchange Clearing Agreements**—Private compensation involved serious difficulties, since it required the offsetting or cancellation of individual exports and imports in each transaction. This difficulty is avoided in exchange clearing agreements under which all the claims or certain broad categories of claims arising out of trade between two countries are offset or settled. Exchange clearing agreement first entered into by Germany with Switzer-

land, under which both agreed to pay to their respective central banks the amounts payable to their respective foreign creditors. For instance, the German importers would pay to the German central bank the amount they owed to the Swiss exporters. Likewise, the Swiss importers paid to the central bank in Switzerland the amount they owed to the German exporters. The German exporters would be paid by the German central bank out of the funds paid by German importers. In the same way the Swiss exporters would receive payment from the Swiss central bank out of the funds paid by the Swiss importers. In other words, the importers of a country pay to the exporters of the same country. This system of exchange clearing was essentially one of offsetting each other's payments, and the basic assumption was that the countries entering into such an agreement would see that imports and exports were more or less equal and there was no necessity to make or receive payments in gold or in some free currency like the dollar or the pound sterling.

There were two clear advantages in exchange clearing agreements. Firstly, imports and exports between two countries would take place without the countries being unduly worried about the problem of finding scarce foreign exchange. Secondly, under this system there was no need for a market for foreign exchange or for a country to have reserves of foreign currencies. Exchange clearing agreements had thus favourable effect in promoting international trade between two countries which would not have otherwise taken place. Exchange clearing agreements were applied not only to cover merchandise trade but also to the liquidation of blocked balances, to the transfer of interests and dividends, to tourist expenditure, payments for shipping services and other transactions.

(iii) **Payments Agreements**—While compensation and exchange clearing agreements were generally entered into by countries with exchange control, payments agreements have generally been made between countries with exchange control and countries with free exchange. The main purpose of a payment agreement is to ensure the liquidation or cancellation of financial claims of a creditor country. Under the payments agreement, a country undertakes to regulate its payments made to its partner along certain specified lines. For instance, under the Anglo-German Payments Agreement of 1934, the German Government agreed to earmark 55 per cent of the value of its exports to Britain to pay for imports from that country. Germany further agreed to use 45 per cent of its exports to pay off previous commercial loans of Britain to Germany.

(iv) **Bilateral Trade Agreements or Bulk Purchase Contracts**—This system has become extremely common in recent years. During the Second World War bilateral trade agreements were concluded by Britain to ensure adequate supplies of food and

raw materials. Since the Second World War, Britain entered into bulk-purchase contracts with many sterling and other soft area countries to get regular and steady supply of goods and at the same time, to consume scarce dollars. The important features of bilateral trade agreements for bulk purchase contracts are as follows :

(a) Purchase contracts are entered between the Government of one country with that of another.

(b) The Government of a country agrees to buy fixed quantities of other country's produce or contracts for its entire exportable surplus or for a fixed proportion thereof.

(c) In exchange the Government undertakes to furnish specific amounts of various other goods.

(d) The duration of the contract is ordinarily 1 to 3 years.

(e) These contracts provide for price reviews or price variations within stipulated limits. For example, the British agreement with New Zealand in 1948 provided for :

(i) Britain would buy the entire export surplus of meat for 7 years.

(ii) New Zealand's average exportable surplus of 344,000 tons of meat was to be increased by 50,000 tons by 1955, with the aid of British capital, machinery and materials ;

(iii) Britain agreed to buy nearly all of New Zealand's butter and cheese ; and

(iv) In exchange Britain undertook to supply specific amounts of various kinds of manufactured goods.

Consequences of Bilateralism

During 1930's Germany had made bilateral trade and payments agreements. Through them Germany was able to import military essentials even in the face of acute shortage of foreign reserves. Further, Germany imported only those goods considered essential by the German Government. There were severe restrictions on imports from free exchange countries but there were liberal imports from countries with which Germany had exchange clearing agreements. The Balkan countries which were economically weak became tied to Germany and were forced to import German goods when cheaper goods from elsewhere were freely available. In general, trade policy under bilateralism was no more an instrument of welfare but became an arm of military strategy.

Bilateral trade agreements resulted in reduction in the volume and the profitability of foreign trade. This followed from the fact that exporters in each country were no longer free to sell in the best markets but must sell only to those countries which

were prepared to buy and pay for them. Under bilateralism, there was no question of international specialisation, maximisation of output and equalisation of commodity prices.

At the same time, bilateral trade agreements have helped to bring about some trade between countries when there was no scope for trade. In this sense, bilateralism has been of some use at a time when international trade was continuously declining. At present most countries have bilateral trade agreements with one another. This is specially true in the case of most socialistic countries and underdeveloped countries.

The Concept of the Common Market

Every country constitutes a single market for purposes of internal and external trade. For instance, India is a single large market for the goods produced within the country. There is a common currency, a common banking system and a common system of taxes and duties. It is possible for entrepreneurs to set up industrial units in any part of the country. Capital, labour and enterprise can move freely from one part of the country to another part. India has customs duties and other possible restrictions as regards its external trade. The concept of the common market, on the other hand, refers to the combination of a number of countries which agree to abolish all internal tariffs and trade restrictions and agree further to have a common system of customs duties with other countries. Normally, countries do not like to enter into an agreement setting up a common market or a customs union. But we have two good examples of customs unions or common markets in Europe. A study of them, specially the second one, will give us a clear idea about the concept of the common market, its organisation, its merits and demerits.

The Zollverein in Germany

In the nineteenth century a number of small states in Germany joined together in 1833 and formed a customs union, known as the Zollverein. Before the setting up of the Zollverein, each German state was independent and constituted a separate market and therefore, had its own internal and external tariff. Imports and exports were subject to customs duties. As a result it was extremely difficult for a commodity to move from one state to another. In the beginning of the 19th century, there were as many as 300 tiny states, 300 markets and 300 separate tariffs. The result was restriction of production and of trade. From 1818 onwards attempts were made to bring the different states together in a common market. A customs union was started, abolishing all the tariffs and restrictive practices between different states and having a common system of tariffs with countries outside the customs union. Gradually, the Zollverein led to a political union under the leadership of Prussia. In fact the German empire was the direct result of the Zollverein.

The European Common Market (E.C.M.)

One of the most exciting international developments of this century has been the formation of Six Nations European Common Market, also known as the European Economic Community (E.E.C), consisting of Belgium, France, Italy, Luxembourg, The Netherlands and West Germany. The ultimate objective of the E.C.M is to achieve closer economic and political union among the European people. The immediate objective is to remove trade and other barriers and to ensure rapid economic and social progress through common action. The E.C.M. is to coordinate the economic policies of all the six member countries—known as the Six—provide clear possibilities of larger and freer trade and bring about balanced development within the region. In order to appreciate the working of the E.C.M., it will be useful to understand its background and the circumstances under which it was brought into existence.

Soon after the Second World War, European countries were completely shattered economically and politically. The European nations were reduced to mere non-entities because of the emergence of the giant United States on the one side and Russia on the other. Individually, these nations were small, weak and vulnerable in a world dominated by the industrial giants. They had a large population, as large as that of the U.S.A. and equally skilful and resourceful. But the six nations enjoyed only one third of the income of the U.S.A. There was a basic reason for this. While the American economy was organised to serve a single large market, large enough to absorb the output of huge modernised industries, the European countries remained small and divided. Their industries were small and were organised to serve small restricted markets. Their trade and commerce were hampered and restricted by internal tariffs and quotas. The six nations, therefore, found that collective action was the only possible firm foundation for a closer union. They saw in the common market a practical method of combining their economic strength to make the fullest collective use of their potentialities.

There was another important factor for the setting up of the E.C.M. While United States and Soviet Russia were dominating the European scene soon after the Second World War, the European nations were concerned at the rise of an Afro-Asian group in world affairs. New powers with rich resources and vast potentialities like India and China were coming up. African nations were becoming independent. The emergence of this powerful group of Afro-Asian countries was expected to play a leading role in world affairs. The Western countries realised that their decline and downfall was due mainly to the quarrels, cut-throat competitions for markets and lack of unity. It was in these circumstances that the six western European countries came together, so to be economically strong and politically viable

and powerful enough to play big power politics in a changing world.

The organisation of the E.C.M.

In March 1957, the Six Western European Countries concluded an agreement known as the Treaty of Rome. The Treaty established the European Economic Community (E.E.C.) or the European Common Market (ECM) which came into formal existence on January 1, 1958. The concept of the E.C.M. is fairly simple. The E.C.M. is the combination of six different markets into a single market, wherein all internal tariffs and trade restrictions are abolished and external tariffs on foreign trade are unified and made common for all the Six. This implies that customs duties on goods passing from one E.E.C. country to another will eventually disappear and member countries will charge uniformly the same import duties on all goods imported from outside the E.E.C. In substance the E.E.C. provides for the establishment of a customs union by the development of a single market for the goods of the six member countries through the removal of all inter-state duties and restrictions and through the adoption of common customs tariff in respect of imports from other countries.

The aims of the E.E.C. which has set up the common market are :

(a) To bind the economic systems of the Six member countries and to create one economic community which would be large, varied, efficient and dynamic enough to speed up prosperity and raise the living standards of the people of the E.E.C. ;

(b) To foster the development of the depressed areas of the region and assist in the progress of overseas territories associated with the community ; and

(c) To rationalise development within the E.E.C. to integrate the member states economically, promote unity among them and restore the stature of western Europe in a world in which no country of the region individually could hope to achieve much, either politically or economically.

Implications of a common market

Individual members of a common market will have to surrender their basic right of protecting domestic industries against the competition from other members of the common market, through such traditional methods as import duties, quotas and trade restrictions.

Secondly, the common market area becomes a single economic unit and there is complete free trade in the goods produced by members of the common market.

Thirdly, the industries of the common market are to be protected against the competition from those outside the common

market area. This will be done through the imposition of a common external tariff and other traditional methods.

Fourthly, the member nations of the common market will have to think of the common market rather than of the different national markets. They will have to plan in terms of the whole economy of all the common market countries and not in terms of individual economies.

Finally, in the field of internal trade or external trade, internal economic development or external assistance, all the members of the common market will have to behave, negotiate and act as one single economic unit and not as different nations.

Operational Plan of the European Common Market

Under the Treaty of Rome the customs union would be set up over a period of 12 to 15 years. During this transitional period, tariffs on trade between member states were to be reduced in 10 rounds spread over three stages of four years each. The first six cuts were to be applied during the first two stages. Each of these six cuts in duties was to average 10 per cent, but some variations were allowed in the rate of reduction applicable to individual products. Under this schedule of tariff cuts, it was expected that the average tariff levels of each member state would have been lowered by 30 per cent at the end of the first stage, a minimum of 60 per cent at the end of the second stage and the rest of the 40 per cent of the duties at the end of the third stage. In actual practice, the pace of tariff reduction in the first stage has been faster than that visualised in the Treaty of Rome and it would seem likely that the common market might be established even before the expiry of the full transitional period.

According to the Agreement, the E.C.M. countries should not introduce new import or export duties or levies producing the same effect. They are prohibited from increasing their levies. They have to liberalise their quota restrictions by stages so that, eventually, they would lose their character as quotas. It is useful to remember that the common market cannot become effective unless quantitative import restrictions are simultaneously removed.

The adoption of a common customs tariff in relation to outside countries is the second important feature of the Common Market. In a sense, the adoption of common customs duties is of great significance since it will have a direct impact on the E.C.M.'s trade with the other European countries and also with non-European countries. Besides, it will have important bearing on the course of export planning generally. But the evolution of the common external tariff are highly complex, largely because of the wide disparity in the national tariffs of member countries. The common external tariff is to be introduced over the same transitional period of 12 to 15 years, consisting of three stages of four years each. At the end of the first stage (in January 1962) the

difference between the existing national tariffs and the future common tariff was to be reduced by 30 per cent. At the end of the second stage (1966) the difference was to be reduced by a further 30 per cent and before the end of the third stage of the transition period, the final step to the common tariff had to be taken.

Under the Treaty of Rome, the benefits of the Common Market were to be extended to the associated territories. First of all, member states of the E.C.M. will extend to the associated territories viz. colonies, and newly independent countries which were colonies of the Six, the benefits of the progressive reduction and the eventual removal of customs duties and trade restrictions within the E.C.M. This means that the exports from the associated territories will be allowed duty free entry in the E.C.M. member countries on the same terms as trade between the member countries. Secondly, the associated territories will extend similar benefits to the members of the E.C.M. This means that the exports from the E.C.M. countries will enter the associated territories duty free or on a preferential basis. Finally, the E.C.M. countries will participate in the investment and development programmes in the associated territories. These provisions have been applicable to the dependent countries in Asia and Africa of the Six but also to the newly independent countries of Africa. These provisions were severely criticised by many countries on the ground that :

(a) This is a subtle method of keeping the underdeveloped countries subjective and force them to produce primary products and depend upon the Six for their requirements of manufactured goods.

(b) India and other commonwealth countries were badly discriminated in favour of the associate territories or colonies.

The advantages of the common market

There are a number of political and economic advantages in the European Common Market. We shall emphasise here mainly the economic advantages.

In the first place the organisation of a common market has transformed six little markets into one large market consisting of over 170 million consumers, a market as large as that of U.S.A. or of the Soviet Union. We know that a large market will help in generating economies of scale through increase in the size of individual plants and a high degree of specialisation. Large industrial plants mean large production, lower production costs and lower prices. The competitive position of the industries of the common market will, therefore, rise.

Secondly, the European Common Market has a time bound programme to reduce and gradually eliminate tariffs and quota restrictions within the common market. This will naturally tend

to increase the trade between member countries and a substantial benefit for all.

Thirdly, the reduction and removal of tariffs and other restrictions will naturally intensify competition with the common market countries. This will check high cost of domestic production in individual countries. The competition will inevitably eliminate inefficient firms and regions and help to concentrate production in firms and areas where goods can be produced efficiently and cheaply. Within the common market, only those industries and producers will succeed who can show the highest level of competitive efficiency and productivity. Again, the common market will avoid the wasteful allocation of resources in the community as a whole.

Fourthly, extensive division of labour and specialisation will bring about the most efficient allocation of resources. Besides, production units will be large and highly efficient and therefore, there will be considerable saving in the use of resources. This implies that resources will be available for other purposes as well.

Finally, as every firm and every country in the common market is likely to produce what is best, production costs will be lower, productivity will be higher and ultimately there will be higher living standards for the community as a whole. The pattern of production in a common market will be more efficient and will enjoy substantial internal and external economies. Internal economies will include more extensive division of labour, greater scope for utilising specialised knowledge, enterprise and capital equipment. External economies will consist of more efficient and better transport, power and distribution system, more effective supplier relationships and greater scope for the diffusion of knowledge and training facilities.

The organisation of the E.C.M. has, therefore, been hailed as "watershed in modern history" and as the beginning of a new liberal movement in favour of free trade and economic exchange. The E.C.M. is a customs union permitted under the G.A.T.T. and is obliged under the rules of the G.A.T.T. to offer its outside trading partners concessions, similar to those which it offers to those countries which enter the customs union. The E.C.M. had reduced its external tariffs by 20 per cent on a unilateral basis to indicate its readiness to trade freely with the world. Thus, the E.C.M. can be expected to help in the movement towards multi-lateral trade and exchange.

Some have prophesied that the E.C.M. would become a dynamic venture to bind together enterprising countries for sharing prosperity and the burdens of world development. There is a proposal that an Asian Common market should be set up to promote the trade of Asian countries and further their economic development. Initial talks in this direction are going on in the E.C.A.F.E. and the Asian Development Bank meetings.

Defects and Dangers in a Common Market

There are certain inherent weaknesses and dangers in the organisation of a common market. For instance, the reduction and eventual elimination of customs duties as between member states of the E.C.M. would sharpen competition and pose a threat to inefficient producers in individual countries. Internal adjustments to such open competition and the re-casting of economic activities to suit the new set-up can not be accomplished overnight nor can such an attempt be hurried through. All these facts point out to the need for a gradual change and the Six nations of the E.C.M. have, therefore, deliberately provided for a long period of transition. During this long period of transition, member countries should make the necessary internal adjustments in their productive machinery and in the economic system gradually without undue hardships and disruption.

A serious difficulty of the E.C.M. would be in the field of agriculture. The problems of harmonising agricultural policies in the different countries of the E.C.M. have been found to be far more difficult to solve than those of harmonising industrial and other policies. The real danger in a common market as the E.C.M. is that the different member countries may not see eye to eye on some specific issues and this may become the cause for the end of the common market.

A serious difficulty of countries outside the E.C.M. is the problem of trade diversion. The E.C.M. promotes trade between the member countries (actually such trade becomes internal trade) but discriminates against the non-members. If the difference in cost between the excluded countries and the E.C.M. countries are narrow, then there may not be a diversion of trade. In fact, this is so in the case of manufactured goods and, therefore, trade diversion in manufactured goods is probably relatively unimportant for the world. But there is likely to be substantial diversion in trade in agricultural products. For instance, before the organisation of the E.C.M., West Germany used to purchase its requirements of agricultural products from the British Commonwealth and the United States of America. But now West Germany has diverted its purchases from these productive areas to the relatively high cost production of France.

The formation of the E.C.M. has affected the trade of many European countries which have been excluded from the common market. Seven European countries who were left out formed the "Outer Seven" Free trade area; they were Austria, Denmark, Norway, Portugal, Sweden, Switzerland and the U.K. The "Outer Seven" which have formed the loose federation aimed eventually at free trade have not been so effective and they may ultimately merge with the E.C.M.

Trade diversion has also adversely affected the United States since the trade between the E.C.M. countries and the

U.S.A. has undergone important changes. But the U.S.A. was prepared to pay the economic price for Europe's integration and union. Besides, the United States was able to reduce the adverse effects on its exports to the E.C.M. by establishing manufacturing units inside the Common Market boundaries. The problem of adverse effects on international trade has been particularly severe in the case of Japan, India and other commonwealth countries, whose products have been discriminated against by the preferential position extended to the Associated member countries of the E.C.M.

The E.C.M. has been criticised violently by the communists. The fear of communism and the Russian domination was indeed one of the important factors for the setting up of the E.C.M. The Communists have denounced the E.C.M. as an aggressive organisation likely to strengthen West German militarists and they probably believe that it would go the same way as the Zollverein of the 19th century which started as a customs union but ended in the formation of the German empire. They have also regarded the E.C.M. as an instrument to keep the underdeveloped countries in economic subjection under those European countries which lost their overseas territories during the two world wars. The Asians have criticised the E.C.M. as a trading bloc to keep out their goods from the European market. The Africans have found it as a form of new colonialism.

Thus, different opinions have been expressed about the usefulness of the E.C.M. Some have claimed that the setting up of the common market with lowering of tariffs and removal of tariff restrictions would lead to multilateral trade and exchange for all countries of the world. Others, however, assert that the E.C.M. is an inward look movement creating new and difficult regional barriers and discriminations against the outside world. They further believe that the E.C.M. would become a hostile, narrow minded group, out to exploit other less-favoured regions and areas for its own advancement.

Trade Policy of Important Countries

From the ancient times to the present day, the types of commercial policy that have been most prominent are (a) restriction policy, (b) mercantilism, (c) free trade and (d) protection. We shall explain briefly the four different types of commercial policy and then explain the trade policies of some advanced countries as well as of India, a developing country.

1. TYPES OF TRADE POLICY

A Policy of Restriction—Upto the middle ages, there was no national commercial policy as such, for in fact, there were on nations then as we understand them today. Each country had certain restrictive policy on the activity of the traders and on the movements of goods between countries. These restrictions were placed on the quality, the price and the quantity of the different goods entering into trade.

Mercantilism—In the 18th century, most European countries had adopted the mercantilist doctrine, under which every country attempted to secure a favourable trade balance (excess of exports over imports) by restricting imports and by expanding exports. Great importance was placed on foreign trade and the import of gold. The assumption was that a country should get gold somehow (through excess of exports, for instance), because gold was wealth, and wealth made a country rich, strong and powerful. By using customs duties on imports, domestic agriculture and industry were sought to be protected. It was a general belief at that time that the benefits of trade were necessarily one sided—one nation could gain only at the expense of another. The mercantilist policy failed to appreciate the importance of such invisible factors in international trade such as, international investments, shipping, insurance and banking services, tourists traffic, etc. The policy of mercantilism narrowly restricted international trade.

Free Trade—The trade policy in favour of free trade was originally taken up by the French economists but was later adopted by the English under the inspiration of Adam Smith. England entered the 19th century under a highly protective system based

on mercantilist principle but it took nearly 70 years after the publication of Adam Smith's "Wealth of Nations" for England to adopt free trade fully. The free trade policy of countries was advocated on the grounds that (a) it promoted division of labour, greater efficiency and brought about lower cost of production. (b) Tariff duties caused uncertainty in business and brought about a wrong distribution of natural resources. (c) Tariffs encouraged political corruption and unfair practices by strongly organised groups. (d) They inflicted an unnecessary tax on the consumers and raised their cost of living. (e) They tended to kill foreign trade, because by restricting imports, they restricted a country's exports also. (f) Free trade promoted international peace and goodwill by fostering a greater economic interdependence of nations.

Rise of Protection—After the middle of the 19th century, many countries adopted protection. The main influence came from Alexander Hamilton and Frederick List. Protection was advocated as a method of aiding and encouraging infant industries (newly started industries), to preserve the home market for domestic industries, to keep wealth in the country, to maintain a favourable balance of trade, to prevent dumping, to bring about an increase in employment, to equalise the differences in cost of production between industries at home and those abroad, etc. The commercial policy of protection became very popular with countries after its successful application in Germany, U.S.A. Japan etc. Every country in the world now has been using different degrees of protection.

2. TRADE POLICY OF GREAT BRITAIN

The Policy Upto 1860—In the 18th century, Britain was a mercantilist country. The Government used various restrictive measures to control imports to the minimum and push up exports in all possible ways. Almost every commodity entering the country was subject to stiff customs duties. Shipping, industries and other different aspects of economic activities were strictly controlled. Great Britain then came under the influence of Adam Smith's free trade policy. The customs duties were gradually reduced as a result of commercial treaties entered into between England and France, England and Portugal, and so on. In 1822 the whole shipping code was revised and customs duties on 300 articles were removed. A little later as many as 1,500 statutes prohibiting, regulating and restricting trade were either repealed or reduced. Finally, in 1845 the Government repealed the Corn Laws which were the basis of mercantilist policies of the past. By 1860 Britain had abolished all customs duties except on 45 items—even these were essentially for their revenue yields.

The second half of the 19th century constituted a period of uninterrupted free trade with the minimum amount of discussion

about tariff reforms or a return to a protective policy. In 1903 Joseph Chamberlain undertook a vigorous campaign for a return to protective policy. He called for the retention of free trade as an ideal and its fulfilment through reciprocal trade barriers. He advocated preference for goods produced within the Empire and therefore, he recommended a protection of 10 per cent on manufactured goods with free admission of raw materials and the use of retaliation to force open foreign markets for British goods. In spite of Chamberlain and the Tariff Reform League, Great Britain remained on a free trade basis. Such duties as were imposed were on commodities which were also subject to excise duties domestically. In other words, these duties were not for protection but were intended for revenue purposes. However, the idea of protection did not die but was making headway by the time the First World War started.

After the First World War—Conditions were changing very fast during the First World War. As a result there was a reversal of policy. By 1930, Great Britain had elaborate tariff system, comparable to any tariff system in other countries. The tariff revenue of Great Britain was actually larger than the tariff revenue of the U.S.A. This reversal of policy from free trade to protection was brought about as follows :

(a) During the First World War there was enormous need for revenue and this was sought to be satisfied through numerous types of taxation including customs duties. The Mc Kenna duties of 1915 (named after the Chancellor of the Exchequer, Reginald Mc Kenna) were imposed at the rate of $33\frac{1}{3}$ per cent on such luxuries as motor cars, motorcycles etc. Such duties were expanded to cover many other goods in the successive periods.

(b) In 1916 Britain imposed an import tax on petrol. In the same year it imposed many other taxes as anti-dumping measures.

(c) In 1919 Great Britain introduced the principle of Imperial Preference which made her import duties just one-third of the McKenna duties when applied to the commodities produced in the Empire or her colonies. From time to time the degree of Imperial Preference was increased, sometimes by increasing the general rate charged against non-empire countries.

(d) In 1921 the British Government through a legislation, singled out certain key industries for protection against foreign goods.

In 1932 the Import Duties Act was passed bringing together into a single tariff system all that which had previously been a series of laws. This Act imposed a general ad valorem duties of 10 per cent on all goods imported into the U.K. except on those already subject to the tariff. The Act also authorised the board of trade to introduce import duties upto 100 per cent ad valorem in order

to meet discrimination. The Government was also given the authority to conclude reciprocal trade agreements. The immediate effects of this reversal of British policy were far reaching. It was a decisive factor in the widespread adoption of exchange control, the raising of tariff and the adoption of quantitative trade restrictions and the regulated economic system. It took the smaller manufacturing countries of Europe as well as agricultural exporting countries of the world into a confusion. In 1932 at the Ottawa Conference, the British Government accepted to give a series of preferences for goods of the British Empire. For instance, it would control by quotas the importation of meat as well as dairy products in the interest of the dominion producers. Again it would continue duty free the admission from the dominions of certain products. As a result of these, the U.K. entered into agreement with Australia, Canada, India, South Africa etc. The Imperial preference was a great success as was clear from the fact, that British import from the Empire increased from 29 per cent in 1930 to 40 per cent in 1938 and British exports increased from 43 per cent to 50 per cent in 1938.

In the 1930's the British Government negotiated bilateral trade agreements with the Scandinavian countries with the idea of expanding exports and imports, with Germany on behalf of payments owed to British exporters etc. Agreements were also made with Argentina, the Baltic States, Netherlands, Poland, France etc. During the period after Second World War, Britain has continued with the policies of bilateral trade agreements. It has, however, taken keen interest to promote regional multilateral trade in the Sterling Area countries. It attempted to join the European Common Market but the opposition of France had kept Britain out of the E.C.M.

3. TRADE AND TARIFF POLICY OF GERMANY

The German Empire was formed in 1881 by a combination of 39 independent states. Before 1871 the tariff history of the German States was broadly that of numerous attempts both by individual states and groups of states who simplified their internal and external tariff systems. Under the influence of Adam Smith, Prussia, the leading German State abolished all internal barriers to trade in 1818. There were as many as 60 local tariffs involving nearly 2,800 classes of goods. They led to a great amount of smuggling which made orderly trade and commerce difficult. The abolition of these barriers by Prussia in 1818 was the basis of the Customs Union formed by 17 German States in 1833. This Tariff Union—Zollverein—provided for free trade between the German States and for the abolition of internal and transit duties. The proceeds of the customs were divided among the States according to their population. For practical purposes the German States erected a single tariff against other nations. Generally, the duties of the Zollverein were moderate on manufactured articles,

while raw materials and some manufactured goods were admitted free. The Zollverein, set up in 1834, came to include all the German States by 1852. It had to proceed along the lines of compromise as the Northern States favoured free trade while the Southern members favoured protection. The Northern States were predominantly agricultural and were exporting grain. Therefore, they wanted free trade. On the other hand, the Southern States were gradually becoming manufacturing nations and protection was useful to them.

In 1870 the German Empire was established and the Zollverein was replaced by the Imperial tariff system. In the initial years the Imperial tariff system was liberal and was based on free trade policy. By 1870 the German protection groups forced Chancellor Bismarck to sponsor a protective tariff. Under the law of 1879 all imports were divided into 43 groups subject to moderate taxes. The tariff of 1879 heralded the return of a protectionist period which was in the ascendancy upto the time of the First World War. This reversal of policy after 1879 was due to rapid industrialisation. Before 1870 Germany had surplus food grains and therefore had to export them. As already mentioned the German landlords preferred free trade and there was no powerful group demanding protection. But after 1870, with rapid industrialisation, a powerful group of industrialists demanded protection for domestic industries against foreign competition. At the same time, German agriculture came under stiff competition from Russian and American foodgrains. The German landlords also started demanding protection against imports of foreign foodgrains.

At the end of the First World War and with the conclusion of the Peace Treaty, Germany was denied tariff autonomy for five years and was compelled to give the most favoured nations treatment to the Allies and to the U.S.A. without getting reciprocal treatment. In this period, Germany emphasised protection to agriculture and dairy farming. In the case of manufactured goods the pre-war rates of customs duties had been moderate and these were raised during 1922-23. In 1925 an Independent Germany returned to a protectionist policy, revising customs duties in general. Germany entered into a series of reciprocal agreements with Italy, Switzerland, Sweden, France etc. With business depression of 1929-33, Germany established a general system of import control to prevent the flight of capital and to restrict the amount of exchange available among importers.

Under Adolph Hitler, Germany adopted the same tools as the mercantilists, though modernised and streamlined. Hitler introduced every known method for the purposes of restricting imports, for raising exports, for military preparedness etc. He used confiscation, prohibition, bureaucratic control of imports and exports, licences, quotas, embargoes and exchange restrictions. He cut Germany loose from the world economy and thus escaped

the domination of world prices. By the employment of barter arrangements with various countries, he was able to obtain certain basic supplies without the use of money or other exchange instruments. Hitler was also responsible for an elaborate system regarding food, for building a powerful army and navy, for annexation of countries and expansion of the German nation. The methods used by Hitler were obviously totalitarian.

Lacking colonies, Germany turned more and more after 1933 to her weaker European nations for food and raw material supplies. In so doing she not only got away from problems of ocean transportation but was also able to make her purchases on her own terms and thereby exert control over the production and general economy of her neighbours. In other words, Germany had the benefit of colonies without political responsibilities. By means of foreign exchange control, barter deals and credit and loans, Germany was able to dictate what goods the surrounding countries should grow or process for her. Through its totalitarian methods, Germany was able to destroy the system of multilateral trade and exchange which was built up by Great Britain over a number of decades. In its place, Germany was able to build a new trading system, the centre of which was the German military economy—a bilateral system in which all trade should flow to and from the German economy.

With the end of the Second World War Germany was divided into two parts and was forced to give up its former territories. Germany was forced to pay reparation by the delivery of gold, foreign exchange assets, all machinery and equipment used in the manufacture of arms and ammunition, ocean shipping, and equipment of all industries of any military importance. It was from this humble position that West Germany was able to rise gradually, become a member of the European Economic Community (E.E.C.) and a powerful nation in Europe as well as in the world—all in a matter of 15 years.

4. THE TARIFF POLICY OF THE UNITED STATES OF AMERICA

Before the American Revolution, the commercial policy affecting the colonies was dominated by Britain, the mother country. When the 13 Colonies became independent and formed themselves into the United States of America, the control of external trade became a prerogative of the individual colonies. At the beginning the sentiment was in favour of freedom of trade—because of the dislike of the colonial policy of Great Britain. In 1790, Alexander Hamilton, the Secretary of the Treasury was directed to prepare and report plans for the encouragement and protection of such manufactures as would tend to render the United States independent of other nations, particularly in a military way. Hamilton recommended protection to the United States on the grounds that:

(a) As long as the United States remained an exclusively agricultural and raw material producing country, it would depend upon foreign markets for the sale of its goods and that these markets could never be certain and definite.

(b) It would be desirable to encourage an extensive development of manufacturing for the purpose of providing a reliable and growing market for American agriculture.

(c) The handicaps under which new manufacturing industries laboured in establishing themselves in the face of competition of the established industries of the older industries necessitated the use of tariff duties against imports.

In spite of this clear advocacy of protection, specially, in the name of infant industries, the commercial policy of the United States was broadly free trade. The reason was that the Southern States were pre-dominantly agricultural and commercial and they were more interested in the purchase of manufactured goods at reasonable prices. Besides, there was not much of a manufacturing industry which needed protection. The position, however, changed with the European wars growing out of the French Revolution and the campaigns of Napoleon. They affected conditions in U.S.A. radically. For instance, the high demand for agricultural goods pushed up their prices considerably. Further, English and European manufactures were excluded from the American market and the wars provided extreme protection in the form of prohibition of imports. Many manufacturing industries were started to take the place of foreign imports. The end of the wars in Europe in 1815 affected both agriculture and manufacturing industries and the U.S.A. adopted a protectionist policy with the Tariff Act of 1816. Even then the Southern States stoutly opposed the use of protection.

The Republican Party which came to power through Abraham Lincoln believed in protection as a method of raising the interests of all sections of the community. The outbreak of the Civil War and the need for funds raised the rates to about 37 per cent and the Tariff Act of 1864 raised the customs duties to around 47 per cent on a very long list of articles. Soon after the Civil War, the South lost in prestige and the free trade opposition to the high tariff policy was practically removed.

Between 1870 and 1913, America followed a highly protectionist policy with stiff import duties to protect its manufacturing industries. Though certain concessions in the form of reductions in tariff duties were made in different years, the American Commercial policy was basically protectionist. The tariff of 1913 represented a complete reversal of tariff policy in half a century, with marked revision downwards in important tariff items. Its greatest significance was the change in attitude which it represented. There was a feeling that the U.S.A. had passed beyond the need for protection of its manufactured industries and that it was

about to assume a more important position in world affairs, with which new position, a highly protective tariff was inconsistent. This tariff was in force for only a brief period, when the World War I intervened and established a high degree of protection for American industries. During this period America experienced great prosperity because of the demand for its exports and the favourable balance of trade.

The post-war depression of 1920-21 was responsible for the increased use of protective rates. The Tariff Act of 1922 increased protection to agriculture which had been particularly affected by the collapse in war-time prices. Another feature was the high protection given to the war stimulated industries and to those which were associated with military preparedness. On the whole the rates of the Tariff Act of 1922 were higher than any which had been established in the past.

Since the setting in of the great depression in 1929, the United States increased import duties, partly because imports had been radically reduced and partly because the need for protection had increased due to the world-wide depression. Some felt that the United States had become a creditor country and that her interest in foreign markets gradually led to a change in her commercial policy. It was generally thought that the United States should move towards greater freedom of trade and help in the establishment of multilateral trade and payments, with the minimum of tariff restrictions. This, however, did not materialise.

The victory of the Democratic Party in 1932 meant a change in tariff policy. According to the Act of 1934 the President was authorised to conclude reciprocal trade agreements—the purpose was to expand foreign markets for American exports and to regulate imports in accordance with the characteristics and needs of various branches of American industries. The President was granted the authority to modify the existing duties or other import restrictions. The President was to enter into trade agreements with foreign governments. The United States concluded a number of trade agreements with many countries—as many as 28 agreements between 1934 and 1946.

After the end of the Second World War, the United States has taken leading interest in bringing about a change in commercial policy. Instead of bilateral country-to-country negotiations, the U.S.A. has been advocating multilateral trade discussions and has been working towards the removal of import quotas, payments agreements and other forms of trade restrictions. It was under the leadership of the U.S.A. that the General Agreement on Tariffs and Trade (G.A.T.T.) was concluded which prohibits discriminatory tariffs and the use of import quotas except by countries suffering from balance-of-payments problems. The United States has also taken active interest in the U.N.C.T.A.D. and other conferences.

Despite all these talks about tariff reduction and removal of barriers, protectionist sentiment actually has grown stronger in U.S.A. in the period after 1946. With reconstruction of Japan and Western Europe and the establishment of the E.C.M., competition to American industry has increased. American Labour unions have been opposing importers with low-wage foreign labour. Even the traditionally free-trade Southern States of the U.S.A. have abandoned their historic opposition to high tariffs because of the expansion of industrial development in the South. It is, however, generally realised that unless the United States reduces tariffs, it would be difficult for underdeveloped and developing countries to export goods to that country and import necessary machinery and equipment.

5. COMMERCIAL POLICY OF JAPAN

For some 250 years, since 1600, international trade was actually prohibited by the Japanese Government which inflicted the death penalty on anyone having relations with foreigners. Prior to the opening of the Japanese harbours to the trade of the world in the middle of the 19th century, there was virtually no foreign trade and very little trade between the different sections of that country. Up to 1880, the foreign trade of Japan was small and mostly in foreign hands. As late as 1900, about 60 per cent of the trade was so controlled; but the influence of Japanese merchants was growing all the time.

Although customs houses were first established in 1859, the Japanese government really had no tariff in the ordinary sense. The tariff was essentially a treaty with the different powers and was subject to revision by treaty. This situation persisted until 1911 when a new law of tariff, became effective. Periodically, customs duties were raised to protect the local industries which had begun to develop because of World War I or to prevent dumping, by foreigners.

The Japanese tariff was revised in 1926 with increases on virtually all manufactured goods. The tariff of 1926 was based on the following principles :

- (a) Raw materials were to be free from duties:
- (b) Protection was to be granted to industries with a promising future;
- (c) Reductions were to be made in duties imposed on the necessities of life and on domestic products which could hold their own in competition with imported goods and higher rates were to be used to discourage imports of luxuries.

Since 1934, Japan began a more vigorous application of exchange control and restrictive legislation. This was accelerated in part by the Sino-Japanese war which began in 1937 and in part by the example of other nations. Japan decided to rely upon

bilateral agreements to control trade balances with each nation and to establish a two column tariff. One of the columns was to obtain nearly prohibitive rates, while the lower rates of the other could be obtained by granting most favoured-nation treatment to Japanese goods.

Before the Second World War, the U.S.A. had been consistently both the largest buyer of Japanese products as well as the largest source of Japanese import, accounting for one-fifth to one third of the exports and supplying one-third of the imports. The Second World War completely destroyed this trade relationship. Japan came out of the war completely crippled and had to start from the scratch. With firm and heroic determination on the part of the Japanese and financial assistance from the Americans, Japan started its reconstruction of its industries. As Japan depended upon imported raw materials, it generally followed moderate tariffs. Along with West Germany, Japan serves as an example of what private enterprise and hard work can achieve in the matter of industrialisation.

6. COMMERCIAL POLICY OF INDIA

The commercial or tariff policy followed by the Government of India in the 19th century as well as in the first two decades of the 20th century was governed by British interests. England which was the first to industrialise herself stood to gain by free trade since it needed markets to sell her manufactured goods and also procure essential raw materials for her industries. Since England stood to gain by free trade, she expected all her colonies, including India, to follow a policy of free trade irrespective of their own interests. Up to 1923, India followed a policy of unrestricted free trade. The use of a protective tariff to help or create new industries was not even considered by the authorities. Three important circumstances were responsible for bringing about a change from a policy of free trade to that of protection.

First, the policy of protection had proved successful in a number of European countries, particularly Germany. Germany, Japan, U.S.A. and many others became rapidly industrialised by the imposition of customs duties against the import of foreign goods. It was increasingly realised in India that a policy of free trade was no good for a backward country.

Second, the First World War demonstrated clearly the industrial potentialities of India. The war brought out clearly the weaknesses of a nation depending upon imports of essential goods, such as iron and steel, machinery, etc. Besides, the cutting off of imports on account of the war and the consequent indirect protection given to Indian industries led to the creation of many new industries.

Third, a series of political reforms culminating in the reforms of 1919 clearly indicated the need for not only political freedom,

but also fiscal freedom. In 1921, accordingly, the British Government gave freedom to India to follow any suitable tariff policy or commercial policy.

Discriminating Protection

The Government of India appointed the First Fiscal Commission in 1921 under the chairmanship of Sir Rahimtoola "to examine with reference to all the interests concerned the tariff policy of the Government of India including the question of the desirability of adopting the principle of Imperial Preference". The Fiscal Commission found that India possessed undoubted natural advantage as well as adequate raw materials, cheap power and sufficient labour to enable her to develop her industries. In their report to the Government, the Commission recommended discriminating protection. The Commission proposed that protection should not be given indiscriminately to any and every industry but should be accorded only to those industries which could satisfy certain essential conditions. This policy of selecting industries to grant protection was known as discriminating protection. The Commission recommended three conditions—known as the Triple Formula—for discriminating protection; these three conditions had to be fulfilled by an industry before it could be granted protection. These conditions were:

(a) The industry to be protected should possess natural advantages such as abundant supply of raw materials, cheap power, sufficient supply of labour and a large home market;

(b) The industry must be one which, without the help of a protective tariff, would not be able to develop at all or would not develop rapidly enough to serve the interests of the economy; and

(c) the industry must be able to face foreign competition eventually without tariff assistance.

The Government of India accepted the recommendations of the First Fiscal Commission in 1923. Between 1924 and 1939 several major industries were given protection by the Government, prominent among them being iron and steel, cotton textile, sugar, paper and pulp, match and salt. Among minor industries which also received protection were magnesium-chloride, plywood, tea-chests and gold thread industries. But during the same period, heavy chemicals, oil, coal and glass industries were some industries which applied for tariff protection but were denied the same. The policy of discriminating protection proved to be really beneficial to those Indian industries which were granted tariff protection.

After the Second World War

Upto the end of the Second World War, India was bound with Britain, politically and economically, as part of the British Empire and, therefore, it had to follow the trade and exchange policies of Great Britain. At the same time, India could

enjoy the benefits arising out of the Imperial Preference. India's imports were mostly from Britain and its exports went mostly to Britain and her dominions. After the Second World War, the position changed radically, partly because of India's independence and its ability to trade with all countries of the world and partly because of the difficulty of Britain to satisfy India's requirements for machinery and equipment for economic development. India had to look elsewhere, viz. to the U.S.A. and the dollar currency areas, for her imports. However, India's exports were still going mainly to the British Commonwealth of Nations.

After 1956, India adopted stringent restrictions on imports, and high tariff duties because :

- (a) the balance of trade was heavily adverse ;
- (b) there was an acute scarcity of dollars and the deficit with dollar areas was widening ;
- (c) non-essential imports had to be restricted to conserve foreign exchange for importing foodgrains, essential raw materials and capital goods ;
- (d) import restrictions had to be used to protect domestic industries ; and
- (e) import duties constituted a good source of revenue (in fact the second single largest source of revenue to the Centre now) at a time when the Government required funds for development.

Consistent with her membership of the G.A.T.T., India has fixed quotas for imports of commodities, depending upon the progress and stock position of the indigenous industries. Quotas were reduced for a number of items and imports of some others were banned. Strict exchange control by the Reserve Bank has been an important feature of India's commercial policy in recent years.

The Government of India has been following a policy of concluding bilateral trade agreements with various countries. These agreements are generally directed at promoting exports and at obtaining required imports without causing strain on foreign exchange reserves. When revising existing agreements, an opportunity is taken to omit items in which the country has reached self-sufficiency and to include in export-commodities items in which an export surplus has since emerged. The trade agreements, extensions and modifications were aimed at correcting the imbalance in India's bilateral trade, in addition to opening up new markets for her exports. To promote trade with communist countries, India started the State Trading Corporation (S.T.C.) The S.T.C. enters into deals with the communist countries in such a way that India's foreign exchange reserves are not be strained. India has also made trade agreements with the E.C.M. and other countries, both developed and developing.

As one of the leading developing countries of the world, India has championed the cause of the developing countries in International conferences on tariffs and trade. It has insisted that the developed countries should reduce their tariffs to enable the less developed countries to export and to pay for their essential imports. This, in India's opinion, is a much better alternative than foreign aids and grants for economic development.

7. TRADE POLICY OF COUNTRIES—A GENERAL REVIEW

In the previous section, we have explained briefly the trade and commercial policies of some leading countries of the world in the 19th and 20th centuries. In this section, let us attempt a broad and generalised account of the trade policies of the major countries in the last two centuries.

Rise of Free Trade Policy Upto 1860

Till the beginning of the 19th century, European nations followed mercantilist policies of restriction of imports to acquire gold and to protect domestic agriculture, industry, shipping etc. Britain for instance, had imposed Corn laws to prevent the import of foreign grains and to protect English agriculture. England has passed a series of Navigation laws to promote English shipping. Likewise, import duties were imposed on most manufactures to protect English industries. Britain followed a colonial policy with the aim of making colonies serve as markets for British products and supply raw materials to Britain. France, Germany, Portugal, the Netherland and other European countries had also followed mercantilism in different degrees.

Adam Smith and his classical school of economists were responsible for the overthrow of mercantilist doctrines and for the rise of free trade. Adam Smith's arguments were convincing and came at a time when England was becoming an industrial nation. It was gradually realised that the prosperity of English industries depended upon extensive foreign markets and cheap foodgrains at home (to keep the wages of labour and the cost of production low). As English agriculture was unable to satisfy the local market fully and cheaply, the English manufacturers brought pressure upon the Government to allow free import of grains. The repeal of the Corn laws was the single most important measure for the destruction of mercantilism and the success of free trade policy. There were other measures too such as the removal of Navigation laws, abolition of all import duties except a few which were kept for revenue purposes, the change in colonial policy, and soon.

The free trade policy of Britain came to be adopted by other countries as well. For instance, France was influenced by the conclusion of Cobden-Chevalier Treaty under which France had agreed to cut her import duties, and in some cases remove them

altogether, on reciprocal basis. The German Customs Union also adopted a moderate tariff under the influence of Prussia which had adopted free trade. By 1860 Europe had adopted free trade to a large extent.

Decline of Free Trade and Rise of Protection (1860-1914)

The success of free trade was short-lived, for the conditions favourable to free trade did not prevail for long. Soon after the establishment of the German Empire, there was a persistent demand for protection of the German infant industries. The German landlords (viz., the junkers who controlled the army) were always for free trade because they wanted foreign markets to sell their surplus grains. After 1870 they gave up their support to free trade and demanded protection because of the intense competition from Russian and American agriculture. In the tariff of 1879, Germany had adopted protection instead of free trade. U.S.A. had also adopted a protected tariff to encourage local manufactures. As a result of the adoption of protection by many countries, there was a reaction against free trade and a progressive support to protection in England too. For one thing England was not prepared to follow free trade while all other countries were prohibiting English manufactures in the name of protection. At the same time, England was becoming more and more conscious of the need to bind the colonies with itself and to give preferential treatment to the goods of colonial origin.

Germany, U.S.A. Japan and many other countries had developed rapidly with the use of protective tariff. This was a standing attraction for underdeveloped countries like India to adopt similar measures and bring about rapid industrial development. India gave up her traditional policy of free trade and adopted protection in 1923.

The Inter-War Period and the Great Depression (1918-1939)

The First World War (1914-18) and the Peace Settlement in 1919 destroyed the pre-war pattern of trade and commerce and also the international financial system. Every country—the victor as well as the vanquished—suffered heavily. For instance, Germany lost its empire and was forced to pay heavy damages to the Allies. Britain had to sell many of its foreign assets to finance its war effort and therefore, had lost its investment income, which was considerable before 1914. U.S.A. was the only country which came out of the war in a comfortable position. Many American industries had expanded rapidly during the war and many more had come into existence. There was rapid expansion in agriculture too due to heavy war demand. The post-war depression, however, affected adversely all these. Besides, American industries came in for intensive competition.

Governments were forced to impose new import duties and enhance the existing duties. Some countries resorted to prohibition

of imports, fixing of import quotas and other quantitative restrictions. Not only European countries but also Latin American countries resorted to these measures. Britain gradually was won over to protection and in 1931 it adopted systematic protection.

The great depression (1929-33) was a period of general economic crisis, and country after country adopted stiff tariff policies to protect their industries. In the process they restricted international trade; for after all, cutting down imports by every country meant reduction of international trade—imports of one country constitute the exports of another. Exchange controls, devaluation of currencies etc. were extensively followed. In this period, United States had the highest tariff in its history and other countries were compelled to restrict imports from the U.S.A.

The depression of 1930's gave a boost to bilateral trade agreements. Germany entered into such trade agreements with weak neighbouring States to get trade concessions and to build up her military power. U.S.A. negotiated as many as 31 trade agreements (1934-45) under which it gave tariff concessions in return for similar concessions. These bilateral trade agreements did help to increase the volume of international trade and reduce tariff to some extent, but they could not bring about anything like free trade of the 19th century.

Post-War Period—Multilateral Approach to International Trade

Countries were fully aware of the damage done to international trade by the Second World War and the Great Depression. They wanted to create institutions which would remove the various sources of conflict between nations and which would promote international cooperation. The International Monetary Fund (I.M.F.) was created to bring about fixed exchange rates and a smooth flow of payments between countries. The International Bank of Reconstruction and Development (I.B.R.D.) was created to help in the reconstruction of war damaged economies and for the development of backward economies. Likewise an International Trade Organisation (I.T.O.) was sought to be created to promote a fast recovery of world trade through reduction of tariffs and elimination of controls, quotas, payments agreements etc., which had strangled international trade during 1930's. The I.T.O., unfortunately could not come into existence because of the failure of countries to ratify its charter. Instead, the General Agreement of Tariffs and Trade (G.A.T.T.) came into existence as a result of a series of conferences between countries to reduce tariffs and remove other trade barriers.

The working of the G.A.T.T. is simple. At each G.A.T.T. conference the representatives of different countries meet in pairs and bargain for tariff cuts in those commodities in which they are interested to trade. For instance, India may bargain with Belgium for a tariff cut in glass and chemicals and jute products ;

or it may bargain with U.S.A., for an exchange of mica, manganese and machinery. When all the separate bargains are complete, a single list of all bargains is made and tariff reductions are made applicable to all countries. That is, a tariff reduction made by India to Belgium for jute products will be available to other member countries also. The G.A.T.T. is based on the most favoured nation clause which provides that every tariff bargain should be extended to all member countries.

The G.A.T.T. prohibits discriminatory tariff practices and the use of import quotas except for countries suffering from balance of payments difficulties. However, the G.A.T.T. permits developing countries to adopt such practices to protect their newly started industries or as a method of economic development. The G.A.T.T. has also provided the machinery to resolve disputes arising from trade policy. As a result of the G.A.T.T., there has been a general reduction in tariffs—in some cases between 50 to 75 per cent.

The Rise of the European Common Market

Soon after the Second World War, the Western European countries started the reconstruction of their economies, with massive financial assistance from the United States. In the beginning they started integrating industries, one at a time—as for instance, the setting up of European Coal and Steel Community to make for free trade in coal and steel. However, in 1957 six nations of Western Europe concluded the Treaty of Rome and set up the European Economic Community (E.E.C.) and the European Common Market. By this step, they have agreed to remove their internal tariffs and to have a common external tariffs with all other countries. This was a revolutionary step, with far reaching economic and political implications. Leading countries like U.K. and U.S.A., which were outside the E.C.M. lost the common market in the sense that their products had to pay tariff duties while the products of the Six member nations could move freely within the common market. U.S.A. was able to overcome this difficulty by starting industries in western Europe. Even by the beginning of 1960's, American production in Europe was twice as much as American exports. It was, however, thought that American production abroad would slow down domestic production in U.S.A., and would adversely affect the level of employment.

Attempts are being made to create common markets and free trade zones in other parts of the world also. Informal talks are going on among Asian nations for setting up of an Asian Common Market. In South America as well as in North America free trade areas have been formed. Ultimately the general hope is that some form of multi-lateral trade will be established with considerable reduction in tariffs and removal of quantitative trade restrictions.

Model Questions

I. Man's Economic Activities and Environment.

1. "The mode of life in any given region is not an accident but is a product of environment". Explain this statement.
2. "In particular kinds of geographical environment people tend to behave in certain distinct ways". Examine this statement, giving illustrations in support of your views.
3. What constitute the chief environments of man ? Discuss the influence of any one of them on human activities.
4. Criticise the following giving reasons :—
"Oldest civilizations had developed either in river valleys or on deltas".
5. "No factor of his environment exercises wider influence on man and his economy than climate". How far is this remark true ? Explain briefly with suitable examples.
6. "Animal life as a factor of environment is as effective in influencing human activities as any other factor". Discuss the statement.
7. It is said that "man's ability in exploiting the resources of his environment will depend upon his knowledge, intelligence and culture as on the social structure of the country he lives in". Explain with reference to India.
8. Discuss the effects of political changes on the economic life of the people. In your answer refer to the recent trend in economic spheres in India and Pakistan.
9. Examine from the point of view of agricultural geography the statement that man's increasing control over forces of nature is making him independent of environment.

II. World Population : Distribution and Growth.

10. Examine the following statement critically : "Nearly two-thirds of the human population are concentrated in about 1/10 of the land surface" and describe the pattern of growth and density of world population.
11. Discuss the main tendencies in the distribution of world population and stress the main factors responsible or problems emanating therefrom.
12. Discuss in your own words the impact of population on Economic progress.
13. "The world would have been a much happier place, had there been fewer people living on it". Discuss this statement by a special reference to the ways in which population control can be effected.

III. Major Natural Regions of the World.

14. On the basis of climate divide the world into natural

regions and give reasons why certain regions are self-sufficient in food crops and others do not have enough of them.

15. What do you understand by a "Natural Region ? Into how many Natural Regions can the world be divided ? Name them and indicate their position on a map.
16. "Human life in Equatorial regions has not made much progress in economic, social and political sphere". Examine this statement and explain the reason for this backwardness.
17. State the location of the Monsoon types of regions and give their distribution on the surface of the earth. Discuss the chief climatic features, natural products, crops and industries of these regions with special reference to India.
18. What is a desert ? Describe and account for the hot desert in the tropical zone. Are these areas commercially important ?
19. What is the Mediterranean type of climate ? How does it differ from the Monsoon type ? How do countries enjoying these climates differ from one another in matters of (a) natural vegetation, (b) cultivated crops and (c) industrial development.
20. Wool and wheat are alternative products in many of the temperate grasslands of the world. Where do these conditions prevail ? What circumstances favour the dominance of one over the other ?
21. Examine the characteristics of the Cool Temperate Climate. Mention the areas of the world enjoying this type of climate and discuss their agricultural and industrial development.

IV. Agriculture—Types, Factors, Limits.

22. Discuss the place and nature of agriculture in human economy. To what extent is agriculture dependent on physical factors ?
23. On what factors does the distribution of agriculture on the earth's surface depend ? Which would you consider more important—the natural factors or the economic factors and why ?
24. Describe the different stages in the development of modern agriculture and state how the different stages have tended to become the different types of agriculture in the different regions of the world.
25. Write a short note on Subsistence farming and point out its defects.
26. Describe the conditions and the area where the plantation crops are grown. Examine the significance of the plantation agriculture in the tropics.
27. What do you understand by Arable and Mixed Farming ? Which is better of the two ? Compare the two styles of farming in all their aspects.

28. What do you understand by intensive and extensive methods of cultivation? Explain in brief. Also show the effect of population density upon the method of cultivation.
29. Write a short note on the Limits of crop production.

V. Agriculture—Food Crops

30. Give geographical and climatic reasons for the distribution of wheat in the different regions of the world. Mention the countries which produce wheat for domestic consumption as well as for export.
31. Give a short account of international trade in wheat? What is the effect of the harvest season in different parts of the world on this trade?
32. "Rice and wheat present contrast in farm economy". Elaborate.
33. Analyse the physical and economic conditions bearing on the production and international trade in rice.
34. What climatic and physical conditions are necessary for the production of Sugar-cane and Sugar-beet? In what parts of the world are these chiefly produced? State the nature of the world trade that passes in sugar.

VI. Agriculture—Beverage Crops

35. What soil and climate conditions are necessary for the production of tea and coffee? How are these products prepared for the market? Name the principal world producers and exporters.
36. Discuss the physical conditions necessary for the successful production of tobacco. Describe in brief the process of preparing the product for the market. Give an idea of the relative importance of different countries in the world trade of tobacco.

VII. Agriculture—Industrial Crops

37. Discuss the physical conditions necessary for the growth of jute. State the nature of the world trade that passes in (a) raw jute (b) jute products.
38. Give an account of the world distribution of cotton and discuss its importance in World Commerce.
39. What are the physical and economic conditions that have facilitated the cultivation of Rubber in South East Asia? Discuss the prospects of the natural rubber industry vis-a-vis synthetic rubber.
40. Give in your own words the world production of oilseeds for vegetable oils.

VIII. Forestry—Lumbering

41. Give an account of the forest resources of the world, mentioning the important industries that are chiefly dependent on the produce of the forests.
42. What do you know about lumbering as an industry? Why has it progressed most in temperate regions?
43. Mention the regions of soft-wood forests in the world and explain the physical factors determining the location of Paper Industry.

IX. Fishing

44. Examine the physical conditions necessary for the growth of fishing industry. Mention the principal fishing grounds of the world.
45. Account for the location of the principal fishing grounds of the world and indicate their chief market. Give a comparative idea of their total catch.
46. Why are the main fishing grounds concentrated in the temperate zone? Describe the factors that hinder their growth in Tropical areas.

X. Animal Husbandary—Sheep and Cattle Rearing

47. Discuss the economic importance of animals in the life of man. Point out the occupations that depend on animals and give their distribution.
48. Describe the geographical conditions determining the world distribution of beef cattle and dairy cattle. Why has not cattle rearing developed as an organised industry in India?
49. About 4/5th of the world's export of wool comes from Argentina and South Africa. Describe the conditions under which sheep is reared in these southern continents and explain why the woollen industry has not developed in any of them in spite of abundance of the raw material.

XI. Energy

50. Discuss the relation of Energy consumption with the economic development of a country.
51. What are the chief sources of mechanical power today? How far do they compete among themselves? Compare and contrast the world importance of coal, hydro-electricity and petroleum as sources of power.
52. Which are the most important Coal producing areas of the world? Write about their production and also point out international trade in Coal.
53. What are the uses to which crude oil is put? Write a short note on the world demand and supply position of crude oil.
54. Give an idea of the world distribution of mineral oil and the countries controlling its production. Discuss in particular, the significance of the fields in Middle East in the context of rivalries of oil trade.

XII. Hydro-electricity and Atomic Energy

55. Discuss in detail the physical factors which are essential for the development of the hydro-electric power. Which countries of the world have developed their water power resources and why?
56. Discuss the importance, growth and future potentialities of Nuclear Power.

XIII. Minerals

57. "The present is a steel age and no country of the world can do without iron ore at the present moment". Discuss.

58. Mention briefly the uses of any four of the following minerals and indicate the important sources of their supply :—
(a) Manganese (b) Copper, (c) Lead, (d) Tin, (e) Zinc and (f) Aluminium.
59. Account for the following fact :
"The Gold mines are the back-bone of South Africa."
60. Give in your own words the production and trade pattern of (a) Silver and (b) Mercury.
61. Write a short note on the world production pattern of trade in Mica.

XIV. Manufacturing Industry—Locational Factors

62. Discuss the factors influencing the localisation of Industries.
63. Discuss how the locational factors in respect of industries have undergone a change as a result of the development of science and technology. What considerations play a dominant role now-a-days ?
64. Discuss the importance of the Steel Industry. Point out the processes of manufacture and the factors of localization. Mention the world position of this Industry.
65. Discuss the factors that have influenced the localisation of Cotton Textile Industry in Great Britain and India.

XV. Some Important Producer and Consumer Goods Industries

66. Indicate the geographical background of the location of the iron and steel industry of the U.S.A. and explain the advantages of the United States over the iron and steel industry of North-West European countries.
67. Describe and account for the distribution of the Iron and Steel Industry in the U.S.S.R.
68. Give an account of Iron and Steel Industry of Great Britain stating :—
(a) Centres and types of manufacture,
(b) Sources of raw materials, and
(c) Markets to which the products are sent.
69. Trace the development and growth of the Iron and Steel Industry of Japan.
70. What factors are responsible for the development of Cotton Textile Industry in U.S.A. and Great Britain ? Describe briefly their Cotton Textile Industries.
71. Estimate the importance of the Textile Industry in the economic life of the Japanese people. Also indicate the chief centres and the present position of the Industry.
72. Discuss the present position and future prospects of Cotton Textile Industry in India.
73. Discuss the world production of synthetic Fibres and Fabrics. Also state how Artificial Silk is fast replacing Natural Silk.
74. Discuss the world distribution of manufacture and trade in Woollen Textiles.
75. Write a detailed note on the importance of Chemical Industry in the world and point out its prospects and problems.

76. Describe the importance, growth and development of Engineering Industry with special reference to Manufacture of Machine Tools or Automobiles or Shipbuilding.

XVI. Transport

77. Discuss the importance of Transport for a country's Economic Development.
78. Why is oceanic Transport cheaper? Account for the great commercial importance of the North Atlantic Route.
79. Write an account of the Suez Canal route and describe the importance of the Suez Canal in the International Trade of India and West European countries.
80. Describe, with the help of a sketch, the Panama Canal. Name the ports at its ends. Discuss its importance to international commerce, especially to the U.S.A. and Canada.
81. Discuss the physical factors favouring the development of inland waterways, taking examples mainly from Europe or the U.S.A.
82. Discuss the relative advantages and disadvantages of land, water and air transport. Name the trans-continental railways of Eurasia and North America.
83. Discuss the physical factors which have a controlling effect on air transport. Mention the principal air routes between the Western and the Far Eastern countries and the nature of traffic carried by them.
84. What are the advantages of air transport over other means of transport? Draw a sketch map of the world and indicate therein the principal Air Routes between Europe and India and the Far East.

XVII. The Basis of International Trade

85. Why does international trade arise? What are the advantages of international trade.
86. What is the economic justification of international trade?
87. "International trade in commodities is a substitute for international mobility of the factors of production." Discuss.
88. What are the causes and effects of international trade?
89. "International trade takes place because of the differences in factor endowment between countries." Elucidate.

XVIII. The Comparative Advantage Principle.

90. State and explain the principle of comparative cost as an explanation of international trade.
91. State and criticise the comparative cost doctrine of international trade.
92. Explain clearly the classical theory of international trade. What are its limitations?
93. Explain the theory of comparative cost. How far is this theory applicable to international trade in modern times?
94. Explain the principle of comparative cost. Does it imply complete specialisation amongst the trading countries.
95. Discuss the theory of comparative cost. To what extent has the practical importance of the theory been reduced by tariffs, quota restrictions, exchange control and other regulatory devices.